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No. 119

REPORT

OF THE

NATIONAL ACADEMY OF SCIENCES

FOR THE YEAR

1921

WASHINGTON
GOVERNMENT PRINTING OFFICE
1922

67TH CONGRESS
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REPORT

OF THE

NATIONAL ACADEMY OF SCIENCES

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1922

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LETTER OF TRANSMITTAL.

NATIONAL ACADEMY OF SCIENCES,
Washington, D. C., January 20, 1922.

SIR: I have the honor to transmit to you herewith the report of the president of the National Academy of Sciences for the last half of the fiscal year ended June 30, 1921.

Very respectfully,

CHARLES D. WALCOTT,
President.

Hon. CALVIN COOLIDGE,
Vice President of the United States.

ACT OF INCORPORATION.

AN ACT To incorporate the National Academy of Sciences.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That Louis Agassiz, Massachusetts; J. H. Alexander, Maryland; S. Alexander, New Jersey; A. D. Bache, at large; F. B. Barnard,[1] at large; J. G. Barnard, United States Army, Massachusetts; W. H. C. Bartlett, United States Military Academy, Missouri; U. A. Boyden,[2] Massachusetts; Alexis Caswell, Rhode Island; William Chauvenet, Missouri; J. H. C. Coffin, United States Naval Academy, Maine; J. A. Dahlgren,[2] United States Navy, Pennsylvania; J. D. Dana, Connecticut; Charles H. Davis, United States Navy, Massachusetts; George Englemann, Saint Louis, Missouri; J. F. Frazer, Pennsylvania; Wolcott Gibbs, New York; J. M. Giles,[3] United States Navy, District of Columbia; A. A. Gould, Massachusetts; B. A. Gould, Massachusetts; Asa Gray, Massachusetts; A. Guyot, New Jersey; James Hall, New York; Joseph Henry, at large; J. E. Hilgard, at large, Illinois; Edward Hitchcock, Massachusetts; J. S. Hubbard, United States Naval Observatory, Connecticut; A. A. Humphreys, United States Army, Pennsylvania; J. L. Le Conte, United States Army, Pennsylvania; J. Leidy, Pennsylvania; J. P. Lesley, Pennsylvania; M. F. Longstreth, Pennsylvania; D. H. Mahan, United States Military Academy, Virginia; J. S. Newberry, Ohio; H. A. Newton, Connecticut; Benjamin Peirce, Massachusetts; John Rodgers, United States Navy, Indiana; Fairman Rogers, Pennsylvania; R. E. Rogers, Pennsylvania; W. B. Rogers, Massachusetts; L. M. Rutherford, New York; Joseph Saxton, at large; Benjamin Silliman, Connecticut; Benjamin Silliman, junior, Connecticut; Theodore Strong, New Jersey; John Torrey, New York; J. G. Totten, United States Army, Connecticut; Joseph Winlock, United States Nautical Almanac, Kentucky; Jeffries Wyman, Massachusetts; J. D. Whitney, California; their associates and successors duly chosen, are hereby incorporated, constituted, and declared to be a body corporate, by the name of the National Academy of Sciences.

SEC. 2. *And be it further enacted*, That the National Academy of Sciences shall consist of not more than fifty ordinary members, and the said corporation hereby constituted shall have power to make its

[1] The official list of members gives the name of F. A. P. Barnard.
[2] Declined.
[3] The official list of members gives the name of J. M. Gillis.

own organization, including its constitution, by-laws, and rules and regulations; to fill all vacancies created by death, resignation, or otherwise; to provide for the election of foreign and domestic members, the division into classes, and all other matters needful or usual in such institution, and to report the same to Congress.

SEC. 3. *And be it further enacted*, That the National Academy of Sciences shall hold an annual meeting at such place in the United States as may be designated, and the Academy shall, whenever called upon by any department of the Government, investigate, examine, experiment, and report upon any subject of science or art, the actual expense of such investigations, examinations, experiments, and reports to be paid from appropriations which may be made for the purpose, but the Academy shall receive no compensation whatever for any services to the Government of the United States.

SOLOMON FOOTE,
President of the Senate pro tempore.
GALUSHA A. GROW,
Speaker of the House of Representatives.

Approved, March 3, 1863.
ABRAHAM LINCOLN, *President.*

AMENDMENTS.

AN ACT To amend the act to incorporate the National Academy of Sciences.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the act to incorporate the National Academy of Sciences, approved March third, eighteen hundred and sixty-three, be, and the same is hereby, so amended as to remove the limitation of the number of ordinary members of said Academy as provided in said act.

Approved, July 14, 1870.

AN ACT To authorize the National Academy of Sciences to receive and hold trust funds for the promotion of science, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the National Academy of Sciences, incorporated by the act of Congress, approved March third, eighteen hundred and sixty-three, and its several supplements, be, and the same is hereby, authorized and empowered to receive bequests and donations and hold the same in trust, to be applied by the said Academy in aid of scientific investigations and according to the will of the donors.

Approved, June 20, 1884.

AN ACT To amend the act authorizing the National Academy of Sciences to receive and hold trust funds for the promotion of science, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the act to authorize the National Academy of Sciences to receive and hold trust funds for the promotion of science, and for other purposes, approved June twentieth, eighteen hundred and eighty-four, be, and the same is hereby, amended to read as follows:

"That the National Academy of Sciences, incorporated by the act of Congress approved March third, eighteen hundred and sixty-three, be, and the same is hereby, authorized and empowered to receive, by devise, bequest, donation, or otherwise, either real or personal property, and to hold the same absolutely or in trust, and to invest, reinvest, and manage the same in accordance with the provisions of its constitution, and to apply said property and the income arising therefrom to the objects of its creation and according to the instructions of the donors: *Provided, however*, That the Congress may at any time limit the amount of real estate which may be acquired and the length of time the same may be held by said National Academy of Sciences."

SEC. 2. That the right to alter, amend, or repeal this act is hereby expressly reserved.

Approved, May 27, 1914.

ANNUAL REPORT OF THE NATIONAL ACADEMY OF SCIENCES.

MEETINGS OF THE NATIONAL ACADEMY.

ANNUAL MEETING.

The annual meeting of the Academy was held at the Smithsonian Institution in Washington, April 25, 26, and 27, 1921.

Eighty-one members and one foreign associate were present, as follows:

MEMBERS.

Abbot, Charles G.
Abel, John J.
Adams, Walter S.
Aitken, Robert G.
Ames, Joseph S.
Angell, James R.
Armsby, Henry P.
Bell, A. Graham
Benedict, F. G.
Birkhoff, G. D.
Boas, Franz
Bridgman, P. W.
Carty, John J.
Cattell, J. McK.
Clarke, F. W.
Clarke, J. M.
Cross, Whitman
Curtis, H. D.
Dall, William H.
Davenport, C. B.
Davis, Wm. M.
Day, Arthur L.
Dickson, L. E.
Donaldson, H. H.
Duane, William
Dunn, Gano
Durand, Wm. F.
Fewkes, J. Walter
Flexner, Simon
Freeman, John R.
Hale, George E.
Hall, Edwin H.
Harper, R. A.
Holmes, W. H.
Howard, L. O.
Howe, Henry M.
Howell, W. H.
Hunt, Reid
Jennings, H. S.
Jones, Lewis R.
Kemp, James F.
Kohler, E. P.
Leith, C. K.
Lewis, G. N.
Lillie, F. R.
Lusk, Graham
McClung, C. E.
McCollum, E. V.
Mark, Edward L.
Mendel, L. B.
Mendenhall, C. E.
Merriam, C. H.
Merriam, J. C.
Merritt, Ernest
Millikan, R. A.
Moulton, F. R.
Nichols, E. F.
Noyes, Wm. A.
Osborn, H. F.
Osborne, T. B.
Pearl, Raymond
Ransome, F. L.
Reid, H. Fielding
Rosa, Edward B.
Schlesinger, Frank
Schuchert, Charles
Setchell, Wm. A.
Smith, Erwin F.
Stebbins, Joel
Stieglitz, Julius
Stratton, S. W.
Taylor, D. W.
Trowbridge, Augustus
Ulrich, Edward O.
Veblen, Oswald
Walcott, Charles D.
Webster, Arthur G.
Welch, William H.
White, David
Wilson, E. B.
Woodward, R. S.

FOREIGN ASSOCIATE.

Adams, Frank Dawson

The National Academy of Sciences at the autumn meeting preceeding the annual meeting included in this report took final action in the changing of the fiscal year of the Academy from the calendar year to correspond with the fiscal year of the United States Government. This action was taken in view of the increased activities on account of the work of the National Research Council, which had

changed its fiscal year. This report is for the period from January 1, 1921, to June 30, 1921, and each of the succeeding reports will be from July 1 to June 30 of the following year.

BUSINESS SESSIONS.

The annual report of the president, containing that of the treasurer for the calendar year 1920, in printed form, was presented, accepted, and distributed to members.

ANNOUNCEMENT OF DEATH.

Henry Andrews Bumstead, elected 1913, died December 31, 1920, biography assigned to B. B. Boltwood.

APPOINTMENTS TO SECTIONS AND COMMITTEES.

Sections.—Augustus Trowbridge, acting chairman of the section of physics, to succeed H. A. Bumstead, deceased, term expiring 1923. Arthur L. Day to succeed John M. Clarke as chairman of the section of geology and palaeontology, term expiring 1924. L. H. Bailey to succeed Erwin F. Smith as chairman of the section of botany, term expiring 1924.

Committees.—Henry Draper fund: C. G. Abbot to succeed himself, term expiring 1926.

J. Lawrence Smith fund: F. W. Clarke to succeed R. W. Wood, term expiring 1926.

Comstock fund: R. A. Millikan to succeed himself, term expiring 1926.

Marsh fund: Charles Schuchert to succeed himself, term expiring 1924; John M. Clarke to succeed H. A. Bumstead, term expiring 1923.

Murray fund: William H. Dall to succeed himself as chairman and member, term expiring 1924.

Marcellus Hartley fund: H. F. Osborn and M. I. Pupin, each to succeed himself, terms expiring 1924.

Mary Clark Thompson fund: H. F. Osborn to succeed himself, term expiring 1924.

Auditing committee: Arthur L. Day, Whitman Cross, L. O. Howard.

Tellers to count preference ballot: J. M. Clarke, Whitman Cross, Charles B. Davenport.

Delegates.—T. C. Mendenhall to semicentennial of the Ohio State University, October 13 and 14, 1920. Rear Admiral David W. Taylor, United States Navy, to centennial of the University of Virginia, May 31 to June 3, 1921. H. H. Donaldson, W. M. Davis, and Edgar F. Smith, to the annual meeting of the American Academy of Political and Social Science, Philadelphia, May 13 and 14, 1921. E. B. Van Vleck to the inauguration of Lotus Delta Coffman as president of the University of Minnesota, May 13, 1921.

REPORT OF THE TREASURER.

The report of the treasurer was presented in printed form and approved.

REPORT OF THE HOME SECRETARY.

The home secretary presented the following report, which was accepted:

The PRESIDENT OF THE NATIONAL ACADEMY OF SCIENCES.

SIR: I have the honor to present the following report of the publications and membership of the National Academy of Sciences for the year ending April 25, 1921.

Of the Memoirs of the National Academy of Sciences, volume 14, fifth memoir, Tables of the Exponential Function and of the Circular Sine and Cosine to Radian Argument, by C. E. Van Orstrand, has been completed and distributed. The third memoir of volume 14, Tables of the Minor Planets, by A. O. Leuschner, A. E. Glancy, and S. H. Levy, is now in page proof and will be issued at an early date.

Volume 15 is complete in three parts, all of which are devoted by Psychological Examining in the United States Army, edited by Robert M. Yerkes. This memoir has gone in for final printing and is expected to be issued in a few days. This is also true of the first three memoirs of volume 16, Lower California and its Natural Resources, by E. W. Nelson, first memoir; Studies upon the Life Cycles of the Bacteria, by F. Löhnis, second memoir; and A Recalculation of the Atomic Weights, by F. W. Clarke, third memoir. All of these are expected to be issued and distributed within a short time.

No biographical memoirs have been published since the last annual meeting, as the funds for this purpose were exhausted. Manuscripts for the following biographies are now in the hands of the Home Secretary, and notwithstanding the present lack of funds and discouraging industrial conditions it is hoped that at least a few may be sent in for printing at an early date: Simon Newcomb, by W. W. Campbell, bibliography by R. C. Archibald; Richmond Mayo-Smith, by Edwin R. A. Seligman; Samuel Hubbard Scudder, by Alfred G. Mayor; Samuel Wendell Williston, by Richard S. Lull; George Jarvis Brush, by Edward S. Dana; and Charles Richard Van Hise, by T. C. Chamberlin.

Manuscript for The Tectonic Conditions Accompanying the Intrusion of Basic and Ultrabasic Igneous Rocks, by W. N. Benson, to be published as an academy memoir, is in the hands of the home secretary, awaiting more favorable printing conditions, as are also The Vegetation of the Alpine Region of the Rocky Mountains in Colorado, by Theodore Holm; Osteology of the Reptiles, by S. W. Williston; and American Oaks, by William Trelease.

Publication of the report of the committee of the National Academy of Sciences on the Panama Canal slides has been approved by the President of the United States and is now in the hands of the committee for examination before being sent to the printer.

Since the last meeting I have to report the death of one member; Henry Andrews Bumstead, died December 31, 1920. This leaves an active membership of 186 members, 1 honorary member, and 36 foreign associates.

C. G. ABBOT, *Home Secretary.*

RESEARCH FUNDS.

THE JOSEPH HENRY FUND.

The following recommendation from the council regarding the Joseph Henry fund was approved:

That as the death of Miss Caroline Henry on November 10, 1920, has removed the last surviving heir of Joseph Henry to the income of the Joseph Henry fund, the president be authorized, after he is satisfied as to the status of the fund, to approve the account of the Pennsylvania Co. for insurances on lives and granting of annuities rendered January 13, 1921, and execute the accompanying release to that company as trustee of the Joseph Henry Fund under deed by Joseph Patterson, George W. Childs, and Fairman Rogers, dated June 3, 1878, held by that company in trust to pay over the income to Harriet A. Henry, Mary A. Henry, Helen L. Henry, and Caroline Henry, and after the death of

the last survivor, the principal to the National Academy of Sciences, and that the academy accept the bonds as listed and cash for the mortgages at their face values.

The president was authorized to appoint a committee of five to administer the trust fund known as the Joseph Henry fund, and appointed as members of this committee W. F. Durand, chairman; Arthur L. Day, J. C. Merriam, Charles B. Davenport, and C. E. McClung.

REPORT OF THE DIRECTORS OF THE BACHE FUND.

Since the annual meeting of the academy in April, 1919, the following grants have been made:

No. 222. C. H. Warren, Massachusetts Institute of Technology, Cambridge, Mass., $500. To defray expense of chemical analysis in the study of igneous rocks from Massachusetts.

No. 223. W. Lindgren, Massachusetts Institute of Technology, Cambridge, Mass., $500. For chemical analyses of samples used in a study of additions and losses that limestones (from Bingham, Utah) have suffered in contact metamorphism.

No. 224. T. H. Goodspeed, University of California, Berkeley, Calif., $500. For photographic records and illustration, over a period of three years, for a study of Nicotiana in respect to Mendelian inheritance, of quantitative inheritance, of inheritance of inter-specific hybrids, and of the nature of bud variation.

No. 225. Frank P. Underhill and L. B. Mendel, Yale University, New Haven, Conn., $1,000. For investigations on deficiencies in nutrition.

No. 226. Gilbert N. Lewis, University of California, Berkeley, Calif., $500. For the computation of chemical constants.

No. 227. H. W. Norris, Grinnell College, Grinnell, Iowa, $300. (1) For the investigation of the nervous system of the Elasmo branch fishes; (2) for the study of the Ganoid fishes.

No. 228. Preston Edwards, Laboratory of Physics, Johns Hopkins University, Baltimore, Md., $750. For investigations in acoustics.

The directors of the Bache fund have voted to transfer to capital $1,000 of the accumulated income, which brings the capital of the fund to $60,000.

The above grants practically exhaust the income available until about September, 1921, when the income will begin to exceed the requirements for grants thus made.

The undersigned resigns as a director of the fund on April 27, 1921, at the close of the annual meeting.

E. B. FROST, *Chairman.*

Reports of previous grants have been received as follows:

Nos. 192–203. The researches on igneous rocks of our fellow member of the academy, Prof. J. P. Iddings, have been ended by his untimely death. The chemical analyses had been completed for him, however, and the thin sections were prepared and are now at the National Museum. It is presumably quite feasible for the research to be continued by some other expert. The petrographic microscope bought from the grant has been deposited with the home secretary.

No. 193. Charles A. Kofoid, University of California. The work is in progress. one section being nearly ready for final MS.

No. 211. George H. Shull, Princeton University . The appropriation prevented the interruption of the genetical investigations, which are still in progress. The results have not yet been published.

No. 212. Arthur G. Webster, Clark University. An introductory report was read at the meeting of the academy in 1920; another in preparation.

No. 213. D. S. Johnson, Johns Hopkins University. Sections are being made and studied of the Jamaican liverworts. Results promise to be important, not yet published.

No. 214. Carl H. Eigenmann, University of Indiana. Results published in Memoirs of the Museum of Comparative Zoology, Harvard, vol. 43, parts 1 and 2.

No. 215. H. W. Norris, Grinnell College. The nerves of Amia and Lepidosteus have been worked out and plotted in detail; many drawings, complete for publication.

No. 216. Asa A. Schaeffer, Knoxville, Tenn. Preliminary note published in Anatomical Record, vol. 20, p. 184, 1921. Research is still in progress, but delayed by difficulty in purchasing apparatus.

No. 217. J. C. Jensen, University Place, Nebr. Research delayed by difficulty in securing apparatus, but still in progress.

No. 218. H. Nort, Gouda, Holland. The counts have been completed of the stars on the Franklin-Adams charts in the northern milky way between +10° and −10° of galactic latitude, and first list of suspected variable stars has been sent for publication. An additional grant is desired.

No. 219. H. G. Barbour, Yale School of Medicine. Preliminary results have been published in Proceedings of the National Academy of Sciences and the Proceedings of the Society for Experimental Biology and Medicine. The research is near conclusion.

No. 220 (supplementing No. 214). With this grant Dr. William Ray Allen was sent to Lima, Peru, whence he crossed the Andes in making his collections of fishes. Publications have been made in several places of the results of these explorations, of which only a small part of the cost was paid by the grant from the Bache fund.

No. 221. William Bowie, United States Coast and Geodetic Survey. The grant was not used in 1920, as Congress made a small appropriation for maintaining the International Latitude Observatory at Ukiah, Calif. It will probably be needed during May and June, 1921.

No. 222. C. H. Warren, Massachusetts Institute of Technology. The research on pigmatite and fine granites of Cape Ann is in progress. Five analyses of rocks are completed and the microscopic and field study nearly finished and probably will be ready for publication in the summer.

No. 223. W. Lindgren, Massachusetts Institute of Technology. Eight analyses of rocks have been completed and research is in progress.

No. 224. T. H. Goodspeed, University of California. Research is in progress and data are being accumulated.

Report received and recommendations approved.

REPORT OF THE TRUSTEES OF THE WATSON FUND.

The trustees of the Watson fund recommend that an additional grant of $500 from the Watson fund be made to Prof. John A. Miller, of Swarthmore College, for the continuation of his investigation of parallaxes. Previous grants have been used in paying part of the salary of an assistant who has devoted her time to observing at the telescope and measuring parallax plates and making computations for them. The parallaxes of 50 additional stars are ready to go to press.

An additional grant of $300 to aid Prof. Herbert C. Wilson, of Carleton College, Northfield, Minn., in the determination of photographic positions of the Watson asteroids and of certain other minor planets, is recommended.

Mr. Wilson has furnished many valuable positions for the testing and improving of the tables of the Watson asteroids. Support of his work was temporarily discontinued last year, in anticipation of the adoption of an international program of observation by the International Astronomical Union. For theoretical purposes, it seems important, however, to secure in the near future observations of some of the Watson asteroids as well as of other theoretically important minor planets.

The condition of the fund as of March 31, 1921, is as follows:

Uninvested income	$643.85
Invested income	1,780.00
Uninvested capital	23.75
Invested capital	24,976.25

A. O. LEUSCHNER, *Chairman.*

Report received and recommendations approved.

REPORT OF THE DIRECTORS OF THE WOLCOTT GIBBS FUND.

After their last report had been presented to the academy, the directors of the Wolcott Gibbs fund for chemical research received from Prof. R. L. Datta, University College of Science, Calcutta, an account of his work under grant 8 on the replacement of sulphonic groups by halogens. The paper on this subject by him and J. C. Bhownik, now ready for publication, contains painstaking studies of 34 compounds, which show that in many cases the results are better than those obtained by the ordinary methods. Grant 8 is now closed.

During the past year two appropriations have been made: Grant 9—$500 to Prof. W. D. Harkins, of Chicago University, for the construction of an accurate positive ray apparatus to be used in determining atomic weights in the search for isotopes of the elements. In his annual report Prof. Harkins states that the first steps have been taken in this work. Grant 10—$300 to Prof. R. L. Datta, University College of Science, Calcutta, to provide material for his researches on the temperature of explosion of endothermic substances. One hundred dollars of this grant has been sent to him already, the remaining $200 will follow, when a sufficient amount of income from the fund has been accumulated.

The following reports have been received of work under the grants not yet closed:

Grant 4 (for potentiometer). Prof. Harkins was allowed by vote of the directors to transfer the unexpended balance of his grant, $92, to grant 9, and grant 4 is closed after yielding three excellent papers already reported.

Grant 7 (for air pumps). Prof. Harkins reports that three papers have been published under this grant. The properties of subsidiary valance groups: I. The molecular volume relationships of the hydrates and ammines of some cobalt compounds. II. Subsidiary group mobility as studied by the heat decomposition of some cobalt ammines. By Clark, Quick, and Harkins, Journal of the American Chemical Society, 42: 2483–98 (1920). An apparent high pressure due to adsorption, the heat of adsorption, and the density of gas mask charcoals. By W. D. Harkins and D. T. Ewing. Proceedings, National Academy of Sciences, 6: 49–56 (1920.

Grant 6 (for atomic weight researches). Prof. Baxter, of Harvard University, reports progress on the different lines of work undertaken as follows:

I. The Atomic Weight of Cadmium. The paper on this subject with C. H. Wilson has been sent to the Journal of the American Chemical Society.

II. Impurities of Silver and Iodine. The paper on this subject is essentially ready for publication, but has been delayed in order that it may appear with

the others, which take up the criticisms of Prof. P. A. Guye upon the Harvard methods of determining atomic weights.

III. Atomic Weight of Arsenic. It is hoped that the work with Prof. Yontz on this subject, interrupted by the war, will be finished in the coming summer. Meanwhile Mr. Dorcas is studying the preparation and analysis of arsenious chloride.

IV. Atomic Weight of Mercury. Dr. H. E. Wells has continued the work on mercuric chloride begun by Kobayaski. The results confirm the present accepted value for mercury.

V. Atomic Weights of Silicon and Boron. A Gaede vacuum pump has been bought (leaving a balance of only $4.01). This has proved so effective that there is a good prospect of finishing the work on boron silicon and arsenic in the coming year.

The bursar reports that the unexpended income of the fund on March 31, 1921, amounted to $500 invested and $170.88 uninvested. This latter sum is covered by grant 10.

C. L. JACKSON.
EDGAR F. SMITH.
T. W. RICHARDS.

Report received and recommendation approved.

REPORT OF THE HENRY DRAPER COMMITTEE.

The Draper Committee has unanimously recommended that the Draper gold medal be awarded to Dr. Pieter Zeeman, professor of physics in Amsterdam University, for his discovery of the so-called Zeeman effect and for its applications to researches in magneto-optics, and this recommendation has been confirmed by the academy. The reasons governing the recommendation are set forth in an attached statement.

No awards from the Draper fund have been made in the current year. The financial condition of the fund on March 31, 1921, was as follows:

Invested capital	$10,000.00
Invested income	917.50
Uninvested income	735.99

The sum available for the promotion of research was $1,653.49.

W. W. CAMPBELL, *Chairman.*

April 19, 1921.

Report received and recommendation approved.

REPORT OF THE DIRECTORS OF THE GOULD FUND.

The only grant from the fund during the current year is one for $1,000 to Mr. Benjamin Boss for the support of the Astronomical Journal. In the deed of gift Dr. Gould expressed the desire that the Astronomical Journal be supported from this fund, so far as is necessary.

The condition of the fund is at present as follows:

Invested capital	$19,992.50
Uninvested capital	7.50
Invested income	7,010.00
Uninvested income	232.16

F. R. MOULTON.
E. E. BARNARD.
R. S. WOODWARD.

Report received.

REPORT OF THE COMMITTEE ON THE J. LAWRENCE SMITH FUND.

The committee has the honor to submit the following report for the last year:

No application for aid in any new investigation has been received during the year.

As was reported a year ago, certain results of the investigation of meteor trains conducted by the late C. C. Trowbridge, with the aid of grants from the J. Lawrence Smith fund, have been embodied in four papers by Mabel Weil and transmitted to this committee. These papers have been critically examined by Frank Schlesinger, a member of the committee, who reports that they are well worthy of publication but that some revision and editorial work is desirable. This will require conference with Miss Weil and clerical assistance, involving some expense. If this outlay can be provided for, Prof. Schlesinger will undertake the editorial preparation of these papers for publication.

It seems to the committee desirable that the results of Prof. Trowbridge's work should be published in the Proceedings of the National Academy. It also appears appropriate that the cost of editing the manuscripts by Miss Weil and a material part of the cost of publishing them in the Proceedings be met by a grant from the income of the J. Lawrence Smith fund.

It is recommended that the Academy authorize the chairman of the committee on the J. Lawrence Smith fund to approve vouchers for expenditures incurred in the editing and publication in the Proceedings of the Academy of papers by Mabel Weil, presenting results of researches on meteor trains by C. C. Trowbridge, in the total sum of $300, or as much thereof as may be necessary.

The grant of $400, made in 1917 to Dr. George P. Merrill, United States National Museum, in aid of the chemical study of certain meteorites has not been entirely expended. Further investigations under this grant are now being planned.

The observation of meteor paths and radiants and the computation of parabolic orbits, an investigation under the direction of S. A. Mitchell, by C. C. Olivier and others, which has been supported through a term of years by grants aggregating $2,000 from the J. Lawrence Smith fund, has reached the point of publication of results. A discussion by C. C. Olivier of 22,000 observations, made prior to 1919, is now in press, to appear as a publication of the Leander McCormick Observatory of the University of Virginia.

On April 1, 1921, the available income of the Smith fund was $4,201.35, of which $1,641.35 is in cash and the remainder invested. The only liability is an unpaid grant of $500 to S. A. Mitchell.

Respectfully,

WHITMAN CROSS, *Chairman.*

April 25, 1921.

Report received and recommendation approved.

2138 BANCROFT PLACE,
Washington, D. C., June 30, 1921.

Members of the committee on the J. Lawrence Smith fund.

GENTLEMEN: I inclose a copy of the annual report submitted at the April meeting of the Academy.

The most interesting point is with regard to the appropriation of $300 to aid in preparation and publication of Miss Weil's papers. I explained the situation and stated definitely that the committee were unanimous in the belief that it was a proper and wise use of the Smith fund income to aid in the publication of results of investigation whenever conditions seemed, in the opinion of the committee, to make such expenditure desirable.

There was some discussion, no direct opposition, and, in putting the motion to approve the report, President Walcott pointed out that approval practically made a general precedent, to which he saw no objection. There was no dissenting vote.

Under the approved recommendation, the expenses of Dr. Schlesinger in conferring with Miss Weil and in otherwise preparing her manuscripts can be met and a substantial contribution made toward cost of publication in the Proceedings.

On April 1, 1921, the available income of the Smith fund was $4,201.35, of which $1,641.35 is in cash and the remainder invested. The only liability is an unpaid grant of $500 to S. A. Mitchell.

Sincerely,

WHITMAN CROSS,
Chairman, Committee on the J. Lawrence Smith Fund.

Report received and special appropriations approved.

REPORT OF THE COMMITTEE ON THE COMSTOCK FUND.

On behalf of the committee in charge of the Comstock fund, I beg to report:

(*a*) That the treasurer announces, as of March 31, 1921, an uninvested income of $1,587.77.

(*b*) That the second award of the Comstock prize having been made in 1918, the next award will be due in 1923, and a recommendation from the committee may be expected at the fall meeting of the academy in 1922.

EDWARD L. NICHOLS, *Chairman.*

Report received.

REPORT OF THE COMMITTEE ON THE ELLIOT FUND.

Your committee on the award of the Elliot medal and honorarium for the year 1919 desires to recommend that the award be made to Robert Ridgway, in recognition of his classic work, Birds of North and Middle America, of which Part VIII is the basis of the proposed award.

We are enabled to present herewith a letter (Jan. 29, 1921) by the dean of American zoologists, Dr. J. A. Allen, with a report on Ridgway's work, which presents more fully than we can why Dr. Ridgway should receive this special recognition by the National Academy of Sciences.

CHARLES D. WALCOTT.
FREDERIC A. LUCAS.
HENRY FAIRFIELD OSBORN.

Report received.

REPORT OF THE COMMITTEE ON THE MARSH FUND.

The members of the Marsh fund committee, John M. Clarke, Charles Schuchert, and J. C. Merriam, met at the Astor Hotel, New York City, on Saturday, April 9, 1921, for a consideration of grants suggested to the committee for the year 1920–21. Preliminary to the discussion of the recommendations for grants, Mr. Merriam, chairman of the committee, presented the following statement of funds available for the current year:

"As chairman of the Marsh fund, National Academy of Sciences, you are advised of the condition of that fund as of March 31, 1921, as follows:

Uninvested income	$1,812.57
Invested income	150.00
Uninvested capital	-------
Invested capital	20,000.00

"To the original capital bequest of $10,000 the academy has added interest received from the estate and has authorized the increase of the fund to $20,000 by annual additions from income, and the fund has now reached the authorized amount by the addition of $500 on February 1, 1920."

Considering the sum available, it was deemed by the committee desirable to use a part of the uninvested income for the present year in grants.

After considering the proposals for grants presented to the committee, the following assignment of funds was approved:

C. W. Gilmore, associate curator of the division of palaeontology, United States National Museum. Grant for the purpose of studying the extinct lizards pertaining to the order of Sauria, with a view to the preparation of a monographic study of this group ---------- $400

Dr. Carl O. Dunbar, of the Peabody Museum, Yale University. Grant for the collection of fossil insects from the permian of America, with the understanding that these collections shall be studied by Dr. Tillyard of New Zealand, and that this work shall be conducted under the direction of Dr. Charles Schuchert ---------- 400

Anna N. Tolhurst. Grant for stenographic and clerical labor in completing the biography of James Hall $100

Dr. W. J. Sinclair, of Princeton University, Princeton, N. J. Grant for researches on the fauna of the typical Oreodon Zone of Leidy in the White River Oligocene 400

Monseiur Ferdinand Canu, of Versailles, France, and Dr. R. S. Bassler, of the National Museum, Washington, D. C. Grant for the preparation of materials for monographic studies 400

J. C. MERRIAM, *Chairman.*

Report received and recommendations approved.

REPORT OF THE COMMITTEE ON THE MARY CLARK THOMPSON FUND.

The committee on the Mary Clark Thompson fund recommends that the first award of the Mary Clark Thompson gold medal be made to Charles Doolittle Walcott, Secretary of the Smithsonian Institution, Washington, D. C., for his distinguished and unsurpassed contributions to the sciences of geology and paleontology, at the annual meeting in April.

JOHN M. CLARKE, *Chairman.*

FEBRUARY 23, 1921.

With the approval of 10 members of the council, the home secretary presented the recommendation by mail to the academy. Unanimously approved.

BUILDING PLANS.

The plans prepared by Mr. Goodhue for the building of the National Academy of Sciences and the National Research Council reached Washington during the course of the annual meeting and were placed on exhibition during the last day.

RECOMMENDATIONS FROM THE COUNCIL.

The following recommendations from the council were adopted:

That the election of new members and two members of the council be held Wednesday morning, April 27, 1921.

That the American Security & Trust Co., of Washington, D. C., and Spencer Trask & Co., of New York, be designated fiscal advisers of the academy for the year 1921–22.

That the time and place of the autumn meeting, 1921, be left to the president and home secretary with power.

That the annual dues for the first half of 1921 be $2.50, and for the fiscal year July 1, 1921, to June 30, 1922, $10.

It was the understanding of the council, in connection with the fixing of the annual dues, that only $5 of the annual dues of each member would go to the support of the Proceedings and that the remainder would be credited to the general fund.

AMENDMENT TO RULES.

The following change in Rule V, section 1, was submitted from the council:

Change Rule V, section 1, by striking out all of paragraph 1 except the following:

The publication of the Proceedings shall be under the general charge of the council, which shall have final jurisdiction upon all questions of policy relating thereto. The managing editor, who may be a nonmember of the academy, shall receive a salary, which shall be fixed by the council.

Add the following:

The National Academy of Sciences and the National Research Council shall cooperate in the publication of the Proceedings, beginning with Volume VII.

The management of the Proceedings shall be vested in an executive committee of three, consisting of the managing editor as chairman, for a term of one year, of a representative of the Academy, and a representative of the National Research Council, each to be appointed for a term of three years.

The editorial board shall consist of the home secretary and the foreign secretary of the Academy, the chairman and the permanent secretary of the National Research Council as ex-officio members, and in addition, of ten representatives of the Academy and seven representatives of the Research Council, these numbers corresponding to the number of sections of the Academy and the number of divisions of science and technology of the Research Council.

Beginning with Volume VII, the operation of the Proceedings shall be placed upon a budget basis, the size of the volume in any year to be determined by the conditions of the budget, the equal amounts contributed by each organization being determined by mutual agreement before the beginning of each calendar year.

The managing editor of the Proceedings shall be appointed by the council of the Academy and the executive board of the National Research Council upon the nomination of the editorial board.

HUMANISTIC SCIENCE.

The following statement of Mr. J. C. Merriam, as chairman of the committee, on the possibility of adding to the membership of the academy by further representation of eminent investigators in humanistic science was considered and placed on file:

Dr. CHARLES D. WALCOTT,
President National Academy of Sciences.

DEAR DR. WALCOTT: In response to your request for a statement concerning the possibility of adding to the membership of the National Academy by further representation of eminent investigators in humanistic research, permit me to present the following material for your use at the next meeting of the council of the academy:

At a meeting of the council of the academy on April 27, 1919, the president of the academy invited Dr. James H. Breasted to appear before the council to present a communication from a special committee of the American Oriental Society regarding the feasibility of inviting a group of 50 or 60 men to form a national academy of humanistic research under the charter of the National Academy of Sciences. After discussion of the question at this meeting,

it was moved to appoint a committee to consider a plan for carrying out a national organization for humanistic research. The president appointed George E. Hale, E. L. Thorndike, and J. C. Merriam, chairman, to consider this question.

At the annual meeting of the academy on April 26, 1920, this committee reported on its investigation of the relation between the past work of the academy and the field for scientific investigation in humanistic study. Attention was called to the desirability of developing in the academy a strong group of men interested in the scientific aspects of humanistic research such as are represented in phases of scientific application included in engineering or medicine. It was proposed that the academy give careful consideration to three possible methods by which investigators working through application of scientific method in the humanistic field might advantageously be added to the membership of the academy. These methods were as follows:

1. By additions to the section of anthropology and psychology.
2. By establishment of a special section of humanistic research to include a small group comparable to the existing sections of the academy.
3. By formation of a division of humanistic research of the order and magnitude of the academy as now composed of representatives in the natural sciences, assuming, however, that for many years to come the actual number of members of the humanistic division would probably not exceed 50 to 100.

An additional or fourth suggestion involves the possible initiative on the part of the National Academy of Sciences of a movement to call together a group of representatives of humanistic research to form a new academy coordinate with the National Academy of Sciences, but representing investigation in the humanistic fields.

The committee expressed its desire to have these several proposals discussed by the academy, and recommended that after such review the question be considered further and more fully before the council of the academy. It was hoped that the council would present before the academy such a plan as could be presented for vote by the academy.

Recommendations.—As chairman of the committee considering the question of humanistic research I have interviewed many members of the academy in the course of the past two years and have found much support for a view accepting the appropriateness of representation in the academy for such thoroughly scientific work as is carried on in the field of humanistic investigation. This type of study may well accompany the present representation of the fundamental natural sciences, together with economic, medical, and engineering application of science. The academy does not seem to me, in general, to favor extending its work away from investigations of the strictly scientific type, and the members do not, I believe, desire to risk expanding the work of the academy into the field of emotional rather than scientific activity. While it is recognized that scientific work may reach into investigation in humanistics as well as in economics, there is a desire to limit our activities to such a range of subjects as can be comprehended and effectively organized.

With due consideration to all of the data assembled, it appears to me that to represent effectively the unquestioned leadership in all phases of scientific work represented in America, we should make certain that eminent investigators whose approach is strictly scientific should be included in the membership of the academy regardless of the particular field of knowledge in which the work happens to lie. It is the function of the academy to develop all of science not only in recognized distinct departments but also in its entirety. Clear distinction should be made between activities which are based upon

science and reason and those which are directed by emotional or subjective influences, and care should be taken to base the membership of the academy on attainment in purely scientific work.

As to the method which the academy might use in concerning itself with humanistic research, I would remark that if humanistic research is not scientific, it should not be included in the academy, and this body should refrain from taking the initiative to organize another and coordinate body as is suggested under the fourth possibility in the report of the committee in April, 1920.

If investigation in the humanistic field is strictly scientific, I believe that the academy should extend its membership as rapidly as possible to include leaders of thought in this country whose work falls within the scope of this body. The men whose names are added can be attached to existing sections, in some cases, without disorganizing the work of the sections now formed. It does not seem to me desirable to refer humanistic research arbitrarily to the section of anthropology and psychology, although many men will find their place in this section. It may be desirable to form one or more new sections in the course of time, as, for example, in history, if this subject becomes established as a science. For the present I would not recommend establishing a new section .

Inasmuch as the nomination of the members of the academy from sections is at the present time limited to the fields covered by these divisions of the academy, it seems desirable for the council to take the initiative in recommending from year to year the several leaders in the field of humanistic research to be voted upon by the academy as a whole, and to be attached to existing sections until such time as a sufficiently large group appears to warrant the existence and operation of new sections. I do not believe that the number of persons to be added to the present should exceed more than five or six, and that the names which might be considered by the council should include, first of all, persons whose work clearly is scientific, although extended into humanistic fields. Unquestionably, one of the best representatives of this group would be Prof. James H. Breasted.

If I can be of further service to the council I shall be glad to discuss this matter with you or with members of the council.

J. C. MERRIAM.

CONSERVATION OF NATURAL RESOURCES.

The following communication of Mr. Merriam was considered:

The SECRETARY NATIONAL ACADEMY OF SCIENCES.

DEAR SIR: Having been designated as chairman of a committee on conservation appointed by the National Academy of Sciences for the purpose of considering the best methods used in promoting interest in matters on conservation, particularly concerning problems of science and education, I asked the committee of the National Academy to meet jointly with similar committees, of which I am also chairman, appointed by the American Association for the Advancement of Science and the National Research Council. The joint meeting of these committees was held in New York City on Saturday, April 9, 1921, full representation of all of the members being present. At this joint meeting full discussion was had by members of the three committees, and after careful consideration the following resolution was unanimously approved, the chairman being requested to present this resolution for consideration and approval by the organizations represented:

Resolved, That it be recommended by the committee appointed by the American Association for the Advancement of Science, the National Academy of Sciences, and the National Research Council that they form a continuing joint committee on national conservation representing those organizations and that this committee be authorized to set up an executive and secretarial agency for the active prosecution of the work.

May I therefore ask that the matters concerning this resolution be considered by the council of the National Academy of Sciences in the hope that the council may approve this resolution in the near future?

J. C. MERRIAM.

The following recommendations from the council regarding the joint committee on national conservation were adopted:

That the joint committee on national conservation be authorized to set up an executive and secretarial agency for the active prosecution of its work, provided that the funds can be secured.

That the suggestion be made to the chairman of the committee that he apply to the directors of the Bache fund for an appropriation not to exceed $250 for the initial expenses referred to in the report of the chairman of the joint committee on national conservation.

That the president be authorized to appoint three members of a joint committee on national conservation, and that the present committee be discharged.

PUBLICATIONS FOR SCIENTIFIC MEN IN RUSSIA.

A request for the sending of publications for scientific men of Russia was considered, and the president of the academy stated that the Smithsonian Institution will forward publications through the International Exchange Service through the English committee.

NATIONAL RESEARCH COUNCIL.

AMENDMENT TO ORGANIZATION.

The following amendment to the organization of the National Research Council, recommended by that council, was approved:

SEC. 3. The officers of the National Research Council shall consist of a chairman, a chairman of the executive board, one or more vice chairmen, a permanent secretary, and a treasurer, who shall also serve as members and officers of the executive board of the council.

RESIGNATIONS.

The resignations of Mr. Charles D. Walcott as president and Mr. George E. Hale as foreign secretary were presented.

The following letter from the president to the home secretary was read:

DEAR MR. ABBOT: Section 1 of Article II of the constitution of the National Academy of Sciences is as follows:

"The officers of the academy shall be a president, a vice president, a foreign secretary, a home secretary, and a treasurer, all of whom shall be elected for a term of four years, by a majority of votes present at the first stated meeting

after the expiration of the current terms, provided that existing officers retain their places until their successors are elected." * * *

At the time of my election as president of the academy, at the annual meeting in 1917, I stated informally that I proposed to terminate my term at the end of four years, although when elected the constitution provided that the term would be six years. I think that this would be in accordance with the spirit of the present constitution, and I therefore present my resignation as the president of the academy to you, in order that you may notify the membership in sending out the notices for the annual meeting in April, 1921.

Sincerely yours,

CHARLES D. WALCOTT, *President.*

The president stated, in laying his resignation before the academy, that when the constitution was changed, making the terms of officers four instead of six years, he had said that he would retire at the end of four years. He felt, having served the academy nearly 23 years as treasurer, member of the council, vice president, and president, that he should be relieved of the activities and responsibilities of the office in order that he could devote his entire time to research work. He advised the election of a younger man, who could devote more time and energy to the many important matters which will come up in connection with the building for the Academy and Research Council, and called attention to the able efforts of Mr. George E. Hale as foreign secretary and in the organization of the National Research Council. After suggesting and nominating Mr. Hale as his successor the president left the room.

Upon motion of Mr. Hale, which was promptly seconded and adopted, the academy voted that Mr. Walcott's resignation be not accepted, and that he be informed that it was the earnest desire of the academy that he remain as president throughout the full term of six years for which he was elected. After much persuasion Mr. Walcott was finally prevailed upon to continue in office throughout the remainder of his term.

The resignation of Mr. George E. Hale, reading as follows, was presented:

DEAR DR. ABBOT: Please present to the academy my resignation from the position of foreign secretary, to take effect at the next annual meeting. The organization of the division of foreign relations of the National Research Council, of which the foreign secretary of the academy is ex officio chairman, makes it important to elect a foreign secretary who can give adequate attention to the work of the division. He should also keep in close touch with the International Research Council, and attend the meetings of its executive committee, from which I shall be glad to resign as soon as this change can be made.

In closing a term of 11 years as foreign secretary, I wish to express my thanks to the academy and my appreciation of the great privilege of conducting the very interesting work of this office. The possibilities of the International Research Council and its associated international unions, and of the various national committees of these unions in the United States; the interest

shown by the State Department in international scientific relations, and the consequent appropriation by Congress to pay our dues in the International Research Council; and the rapidly growing appreciation by men of science of the possibilities of international cooperation in research, give to the foreign secretary and to the division of foreign relations an opportunity for work of far-reaching importance. I bespeak for my successor the same cordial and unqualified support that the academy and its council have so freely accorded me in the past.

Sincerely yours,

GEORGE E. HALE, *Foreign Secretary.*

The resignation of Mr. Hale was accepted with regret, and with an expression of the academy's high appreciation of his services as foreign secretary. In order that the academy might not lose the benefit of his experience and counsel in its transactions, Mr. Hale was elected to and prevailed upon to accept a seat on the council of the academy.

ELECTIONS.

Foreign secretary.—Mr. R. A. Millikan was elected foreign secretary to complete the unexpired term of Mr. Hale.

Members of the council.—Mr. Raymond Pearl was reelected to membership on the council, term expiring in 1924. Mr. George E. Hale was elected to succeed Mr. W. H. Howell.

Members of the Academy.—The following were elected to membership:

Chapman, Frank Michler, American Museum of Natural History, New York City.

Emmet, William LeRoy, General Electric Co., Schenectady, N. Y.

Harkins, William Draper, the University of Chicago.

Hrdlicka, Ales, United States National Museum.

Kennelly, Arthur Edwin, Harvard University.

MacCallum, William George, Johns Hopkins Medical School.

Miller, Dayton Clarence, Case School of Applied Science.

Miller, George Abram, University of Illinois.

Robinson, Benjamin Lincoln, Harvard University.

Slipher, Vesto Melvin, Lowell Observatory, Flagstaff, Ariz.

Stillwell, Lewis Buckley, 143 Liberty Street, New York City.

Van Slyke, Donald Dexter, Rockefeller Institute, New York City.

Vaughan, Thomas Wayland, United States National Museum.

Washington, Henry Stephens, Geophysical Laboratory, Washington, D. C.

Woodworth, Robert Sessions, Columbia University.

Foreign associates.—The following foreign associates were elected:

Bateson, William, John Innes Horticultural Institution, Merton Park, Surrey, England.

Eijkman, C., University of Utrecht.

The home secretary was requested to transmit the thanks of the Academy to the Smithsonian Institution, the United States National Museum, and to the Cosmos Club for the courtesies extended to its members during the annual meeting.

SCIENTIFIC SESSIONS.

MEETINGS OF APRIL 25, 26, AND 27, 1921.

MONDAY, APRIL 25.

SCIENTIFIC PAPERS.

Gilbert N. Lewis: Ultimate rational units (illustrated).

William Duane: The quantum law and the Doppler effect.

P. W. Bridgman: Preliminary measurements of the effect of high pressures on the thermal conductivities of liquids (illustrated).

C. E. Mendenhall and Max Mason: The stratification of suspended particles (illustrated).

J. R. Carson and J. J. Gilbert (introduced by J. J. Carty and F. B. Jewett): Transmission characteristics of the submarine cable (illustrated).

J. R. Carson (introduced by J. J. Carty and F. B. Jewett): Radiation from transmission lines.

W. F. Durand: Application of the principle of similitude to the hydraulic problem of the surge chamber (illustrated).

E. H. Hall: Theories of osmotic pressure.

E. H. Hall: Comments on the Borelius space-lattice theory of the metallic state.

G. P. Merrill (introduced by Whitman Cross): Metamorphism in meteorites (illustrated).

W. M. Davis: The Island of Tagula (New Guinea), its satellites and coral reefs.

W. M. Davis: The shallow seas of Australasia.

A. G. Webster: On the radiation of energy from coils in wireless telegraphy.

A. G. Webster: On the vibrations of gun barrels.

A. G. Webster: On the problem of steering an automobile around a corner.

Address by His Serene Highness Albert I, Prince of Monaco, Agassiz medalist, Auditorium United States National Museum.

TUESDAY, APRIL 26.

Edward Kasner: A model of the solar gravitational field.

George D. Birkhoff: On the problem of three or more bodies.

L. E. Dickson: Quarternions and their generalizations.

L. E. Dickson: Investigations in algebra and number theory.

H. F. Blichfeldt: On the approximate solutions in integers of a set of linear equations.

H. N. Russell: A provisional theory of new stars.

F. Schlesinger: The compilation of star catalogues by means of a doublet camera (illustrated).

Vernon Kellogg: The National Research Council (by invitation).

W. S. Adams: The order of the stars (illustrated).

C. G. Abbot: Cooking with solar heat on Mount Wilson (illustrated).

F. W. Clarke: The evolution of matter.

Franz Boas: The differences between variable series (by title).

J. M. Clark: Life of James Hall, of Albany, geologist and paleontologist, 1811–1890 (by title).

Austin H. Clark: The classification of animals.

L. O. Howard: Attempts to acclimatize *Aphelinus mali* in France, South Africa, New Zealand, and Uruguay (illustrated).

C. D. Walcott: Note on structure of the trilobite (illustrated).

J. C. Merriam: Origin and history of the Ursidae, or bears, in the Western Hemisphere, with particular reference to the bearing of this question on problems of geographical history (illustrated).

H. F. Osborn: The evolution, phylogeny, and classification of the Proboscidea (illustrated).

Simon Flexner: Experiments in epidemiology.

Graham Lusk: Effect of administering various simple metabolites upon the heat production of the dog (illustrated).

Jacques Loeb: The physical and chemical behavior of proteins (illustrated).

Francis G. Benedict, Edward L. Fox, and Marion L. Baker: The skin temperature of Pachyderms (illustrated).

L. R. Jones: The temparture factor in phytopathology (illustrated).

T. B. Osborne and L. B. Mendel: Results of feeding experiments with mixtures of foodstuffs in unusual proportions (illustrated).

C. B. Davenport: Population (illustrated).

E. L. Thorndike: Measuring higher grades of intelligence.

Raymond Pearl and Charmian Howell: A study of specific forces of mortality (by title).

PRESENTATION OF MEDALS.

At the annual dinner of the academy, held at the Powhatan Hotel on the evening of April 26, 1921, the Agassiz gold medal for the year 1918 was presented to His Serene Highness Albert Honoré Charles Goyon de Matignon-Grimaldi, Prince of Monaco, for his original contributions to the science of oceanography. The Agassiz medal for 1920 was presented through Admiral D. W. Taylor to Rear Admiral Charles Dwight Sigsbee, United States Navy, retired. Admiral Taylor received the medal for Admiral Sigsbee, who was unable to be present. The Henry Draper medal, awarded to Pieter Zeeman, professor of physics in the Amsterdam University, for his discovery of the so-called Zeeman effect and for its application in magneto-optics, was presented to Dr. J. B. Hubrecht, secretary of the legation of the Netherlands, for transmittal to Dr. Zeeman. The Daniel Giraud Elliot medal and honorarium, awarded to Robert Ridgway in recognition of his classic work, "Birds of North and Middle America," was presented to the home secretary for transmittal to Mr. Ridgway. The public-welfare medal was presented to Dr. Charles Wardell Stiles, of the United States Public Health Service. The award was made for his application of science to the public welfare in the recognition and eradication of the hookworm disease. Dr. William H. Welch presented the Mary Clark Thompson medal to Dr. Charles Doolittle Walcott, Secretary of the Smithsonian Institution and president of the Academy. The award was made for his distinguished contributions to the sciences of geology and paleontology, and was kept secret from President Walcott up to the time of its presentation, the approval of the Academy having been secured by mail.

REPORT OF NATIONAL RESEARCH COUNCIL FOR THE PERIOD JANUARY 1–JUNE 30, 1921.

[Prepared by Vernon Kellogg, permanent secretary, and by the chairmen of divisions.]

INTRODUCTION.

The change in the fiscal year of the National Academy of Sciences and National Research Council from the calendar year to one beginning on July 1 of each year and closing on June 30 of the succeeding year brings it about that the last (fifth) annual report of the National Research Council, covering the year 1920, presented an account of the organization of the council which is, in effect, identical with that for the first half of the calendar year 1921, for which period the present report is made. Hence it will be unnecessary to repeat the organization account here.

The activities, also, of the council and its component divisions and committees of the present half year are mostly only the continuation of those already described (in the fifth annual report) for the latter half of 1920. However, certain additions to these activities have been made and these new matters are presented in the reports of the divisions herewith. Certain new publications have been issued in the bulletin and reprint and circular series of the council, which are listed in the report of the committee on publications.

CHAIRMAN AND VICE CHAIRMEN.

The council made no election of a chairman to succeed Dr. Bumstead, whose death on December 31, 1920, was noted in the fifth annual report. Dr. Charles D. Walcott, secretary of the Smithsonian Institution, and president of the National Academy of Sciences, and first vice chairman of the council, assumed the authority of chairman. The executive board, at its meeting on April 24, decided to elect no chairman for the coming fiscal year, but created the position of chairman of the executive board, to which office Dr. John C. Merriam, president of the Carnegie Institution of Washington, was elected. Dr. Charles D. Walcott, first vice chairman; Gano Dunn, second vice chairman; and Dr. Robert A. Millikan, third vice chairman, were reelected.

PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES.

The council has selected the following members to represent it on the editorial board of the Proceedings of the National Academy of

Sciences, in conformity with arrangements made with the academy whereby the council shares with the academy the editorial and financial responsibility of the Proceedings: Member of the executive committee, Vernon Kellogg; members of the editorial board, the chairman and permanent secretary of the council, and Messrs. Adams, Cottrell, McClung, Mathews, McCoy, Millikan, Ransome, Trowbridge, Wissler, and Yerkes.

AMERICAN GEOPHYSICAL UNION.

The relation of the American Geophysical Union to the council was changed so that the union as a whole is replaced as a committee of the executive board by the executive committee of the union.

SIGMA XI.

The president of the Sigma Xi Society has been made an ex officio member of the executive board, such election to be made automatically in the case of each successive president.

COMMITTEE ON NATURAL RESOURCES.

By joint action of the National Academy of Sciences, American Association for the Advancement of Science, and National Research Council, a joint committee on natural resources, representing all three of these scientific organizations, has been instituted.

PUBLICATIONS.

Up to April 12, 1921, 11,385 copies of the various issues in the bulletin series of the council and 14,498 copies of issues of the reprint and circular series had been distributed. The following issues in each series have been issued or have gone to press since January 1, 1921:

BULLETIN OF THE NATIONAL RESEARCH COUNCIL.

VOLUME 1.

No. 6. Data relating to X-ray spectra. By William Duane. November, 1920. 26 pages.

No. 7. Intensity of emission of X rays and their reflection from crystals. By Bergen Davis. Problems of X-ray emission. By David L. Webster. December, 1920. 47 pages.

No. 8. Intellectual and educational status of the medical profession as represented in the United States Army. By Margaret V. Cobb and Robert M. Yerkes. February, 1921. 76 pages.

VOLUME 2.

No. 9. Funds available in 1920 in the United States of America for the encouragement of scientific research. Compiled by Callie Hull. March, 1921. 81 pages.

No. 10. Report on photo-electricity, including ionizing and radiating potentials and related effects. By Arthur Llewelyn Hughes. April, 1921. 87 pages.

No. 11. The scale of the universe. Part I, by Harlow Shapley. Part II, by Heber D. Curtis. May, 1921. 47 pages.

No. 12. Cooperative experiments upon the protein requirements for the growth of cattle. First report of the subcommittee on protein metabolism in animal feeding. By Henry Prentiss Armsby, chairman. June, 1921. 70 pages.

No. 13. The research activities of departments of the State government of California in relation to the movement for reorganization. By James R. Douglas. (In press.)

No. 14. A general survey of the present status of the atomic structure problem. Report of the committee on atomic structure of the National Research Council. By David L. Webster and Leigh Page. (In press.)

No. 15. A list of seismologic stations of the world. Compiled by Harry O. Wood. (In press.)

REPRINT AND CIRCULAR SERIES OF THE NATIONAL RESEARCH COUNCIL.

No. 11. A survey of research problems in geophysics. Prepared by chairmen of sections of the American Geophysical Union. October, 1920. 57 pages.

No. 12. Doctorates conferred in the sciences in 1920 by American universities. Compiled by Callie Hull. November, 1920. 9 pages.

No. 13. Research problems in colloid chemistry. By Wilder D. Bancroft. (In press.)

No. 15. Researches on modern brisant nitro explosives. By C. F. van Duin and B. C. Roeters van Lennep. Translated by Charles E. Munroe. (In press.)

No. 16. The reserves of the Chemical Warfare Service. By Charles H. Herty. February, 1921. 17 pages.

No. 17. Geology and geography in the United States. By Edward B. Mathews and Homer P. Little. April, 1921. 22 pages.

No. 18. Industrial benefits of research. By A. J. Wadhams and Charles L. Reese. February, 1921. (In press.)

No. 19. The university and research. By Vernon Kellogg. (In press.)

CHEMICAL EXHIBIT AND LECTURE.

A popular chemical exhibit, "to show the American people what the chemist has done and may do for them," prepared by the Chemical Warfare Service of the United States Army, and revealing especially the achievements in the chemical industries concerned with the production of dyes, pharmaceuticals, war gases, and explosives, was held in the building of the council in Washington from February 24 to May 14. After this it was transferred to the House of Representatives Office Building, where it remained from May 16 to May 28. Arrangements have been made to install it as a permanent exhibit in the United States National Museum. Duplicates of the exhibit were shown in Philadelphia and New York.

In connection with the opening of the exhibit, a lecture on "The reserves of the Chemical Warfare Service" was delivered under the auspices of the council in the auditorium of the United States National Museum by Dr. Charles H. Herty, editor of the Journal of

Industrial and Engineering Chemistry and chairman of the committee of the National Research Council to cooperate with the Chemical Warfare Service.

INTERNATIONAL DUES.

By act of Congress, the dues heretofore assumed by the National Research Council in connection with American representation in the International Research Council and Associated International Unions will be paid for the year 1921 by an appropriation included in the diplomatic and consular appropriation bill.

NEW BUILDING.

The plans prepared by Mr. Bertram Goodhue, of New York, for the new building for the National Academy of Sciences and National Research Council have been approved by the Fine Arts Commission and accepted by the Carnegie Corporation, National Academy of Sciences, and National Research Council. The Carnegie Corporation has therefore declared its readiness to meet the expenses as incurred in the erection of the building. It is planned to begin work on the building in the fall of 1921.

REPORTS OF DIVISIONS.

DIVISIONS OF GENERAL RELATIONS.

DIVISION OF FEDERAL RELATIONS.

[CHARLES D. WALCOTT, *Chairman.*]

(For present personnel, see Appendix A.)

The division of Federal relations held its annual meeting on April 6, 1921, when a very comprehensive report was presented by the committee on scope of Government service and discussed at length. A new committee on this important work was formed and authorized to go forward with the bringing together of information as quickly as possible. The committee has been formulating plans and is making progress, but at the close of the year is not ready to recommend any action as to policy regarding the research work of the Government for the future.

Since January 1, 1921, the following new appointments to fill vacancies were announced: Mr. H. Foster Bain to succeed Mr. F. G. Cottrell as representative of the Bureau of Mines of the Department of the Interior; Maj. Gen. Amos A. Fries to succeed Maj. Gen. W. L. Sibert as representative of the Chemical Warfare Service of the War Department; Mr. William A. Kinnan to succeed Mr. M. H. Coulston as representative of the Patent Office of the Department of the Interior.

The division as it stands has as members representatives from the same departments of the Government listed in its last annual report, there being no changes or additions to the representation of any department.

DIVISION OF FOREIGN RELATIONS.

[ROBERT A. MILLIKAN, *Chairman.*]

(For present personnel, see Appendix A.)

The committee of the division of foreign relations on Pacific investigations, which was organized to continue plans which have been developing for over 10 years for promoting systematic scientific investigations in the Pacific region as a natural and logical unit for study, has been reorganized and now consists of the following members: Herbert E. Gregory, chairman, Bishop Museum, Honolulu; T. Wayland Vaughan, vice chairman, United States Geological Survey; William Bowie, United States Coast and Geodetic Survey; Barton W. Evermann, California Academy of Sciences; John C. Merriam, Carnegie Institution of Washington; William E. Ritter, Scripps Institution for Biological Research; Clark Wissler, American Museum of Natural History.

Believing that, preliminary to definition of the scientific problems of the Pacific and the formulation of plans for working on them, a system of relationships should be set up between the leading scientific bodies of the countries within or contiguous to the Pacific Basin, a communication inviting cooperation has been addressed to about 35 scientific societies and other agencies in those countries. A number of replies have already been received favoring the proposed association of scientific interests. The next step will doubtless be the calling of a conference for perfecting such organization as may be necessary and for continuing the consideration of scientific problems of the Pacific such as were presented at the scientific conference held at Honolulu in August, 1920, and at the Pacific coast conference held at the University of California in March, 1918. It is believed that plans for these investigations and for the conferences to be called upon them can go forward successfully only if under the direction of the scientific organizations which by nature are chiefly concerned with such investigations. This committee has now under consideration several projects of investigation upon problems of the Pacific area.

In April Dr. Augustus Trowbridge, secretary of the division of Federal relations and chairman of the division of physical sciences, went abroad to attend the meeting of the executive committee of the International Research Council in Paris as representative of the

National Research Council. Although the meeting was necessarily deferred beyond the date originally appointed, Dr. Trowbridge was able, through individual conferences, to accomplish the business of his trip before being obliged to return to this country, especially in effecting cooperation with M. Marie, the publisher of the annual tables of physical and chemical constants, permitting the use of advance information in the preparation of the critical tables of physical and chemical constants for the publication of which the United States is responsible.

Through the efforts of the Department of State an item of $2,658 was included in the diplomatic and consular bill as recently passed by Congress for the payment of the dues of the United States in the following international bodies: International Research Council, International Astronomical Union, International Union of Pure and Applied Chemistry, International Union of Geodesy and Geophysics, and the International Mathematical Union.

The annual meeting of this division was held in Washington on April 19. At this meeting reports were rendered from the various international unions in which the research council is represented. The following table presents the membership in certain of these unions at present:

International Research Council.	International Union of Astronomy.	International Union of Geodesy and Geophysics.	International Union of Pure and Applied Chemistry.	International Union of Mathematics.
Australia				
Belgium	Belgium	Belgium	Belgium	Belgium.
Canada	Canada	Canada	Canada	
			Czechoslovakia	Czechoslovakia.
Denmark			Denmark	
France	France	France	France	France.
Greece	Greece	Greece	Greece	
Holland			Holland	
Italy	Italy	Italy	Italy	Italy.
Japan	Japan	Japan	Japan	Japan.
Mexico	Mexico	Mexico		
Monaco		Monaco		
Norway				
			Poland	
Portugal		Portugal		
Serbia				
Spain	Spain	Spain	Spain	
Sweden				Sweden.
Switzerland				
United States	United States	United States	United States	United States.
United Kingdom	United Kingdom	United Kingdom	United Kingdom	United Kingdom.

DIVISION OF STATES RELATIONS.

[JOHN C. MERRIAM, *Chairman.*]

(For present personnel, see Appendix A.)

The work of the division of states relations has been continued upon the two problems which were undertaken last year: (1) A study of the status of scientific research in State government, and (2) a study of the nature of the scientific work undertaken cooperatively between bureaus of the Federal Government and corresponding departments in State governments or other non-Federal agencies.

In connection with the first problem it is planned to publish certain of the material collected concerning the situation of research in State government. The first report of this nature to be published will be that of Dr. J. R. Douglas, formerly assistant professor of political science in the University of California, upon "The research activities of departments of the State government of California in relation to the movement for reorganization." This is now in press in the bulletin series of the council. A report upon the activities of the committee on scientific research of the State council of defense of California during the war years is now being prepared for publication similarly. For the further orientation of the division upon this problem the annual meeting of the division in Washington, on May 27, was made the occasion for a symposium upon the conditions affecting scientific research under State government auspices.

The second project has been taken up with all of the scientific bureaus of the Federal Government, and reports are now being prepared by these bureaus, making use of standardized report sheets, upon the nature of the projects undertaken by these bureaus cooperatively with non-Federal agencies, and upon the basis of agreement under which this cooperative scientific work is carried on. This project is under the direction of a joint committee representing this division and the division of Federal relations.

DIVISION OF EDUCATIONAL RELATIONS.

[VERNON KELLOGG, *Chairman.*]

(For present personnel, see Appendix A.)

Special attention of the division of educational relations for the first half of the year 1921 has been given to a study of the detection and encouragement of students of superior ability. In the study of means for detecting such students by mental tests, in connection with attainment records, this division has cooperated with the division of anthropology and psychology.

In order to ascertain what has already been done in this matter, this division has maintained Prof. G. W. Stewart, of the department

of physics, University of Iowa, in the field during the greater part of the past semester. Prof. Stewart has visited 66 colleges and universities in the States of Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, North and South Dakota, and Kansas for the purpose of discussing this matter at first hand with members of the faculties of these institutions. In a number of cases opportunities were afforded to meet selected groups of students and to address the student body.

Prof. Stewart has found an earnest interest in this matter in all of the institutions which he has visited, and reports that several means, such as the organization of honor societies, the establishment of honor courses, a repeated careful study of students' records, announcements from platforms and in the local press concerning students of special attainment, are being followed for the encouragement of students of superior capacity.

It is believed that Prof. Stewart's conferences at this large number of institutions have served a useful purpose in directing the attention of those institutions toward the importance of this problem and the peculiar significance of the training of superior students. More concerted efforts in this direction are certain to result in many of those institutions. As a practical means of effecting systematic action upon this matter, continuing from year to year, Prof. Stewart has repeatedly suggested the organization of a standing committee upon scholarship with special reference to superior students. A number of such committees have been organized in the institutions which he has visited. It is planned to publish a report upon Prof. Stewart's studies, and also a series of statements concerning the opportunities for research in the various fields of science. Material for this series is already on hand. The results obtained from Prof. Stewart's work this spring are believed to justify the continuation of the study next fall.

The study of the general conditions of research in colleges and universities which this division has been conducting for over a year and a half has also been continued through the visits of representatives of the council. In all, 140 colleges and universities have now been visited in this way. Plans are now under consideration for extending this study of research conditions to a study of the special situation to be found in the various fields of science.

The division has continued the encouragement of the formation of research committees in colleges and universities. In correspondence with these committees and with officers of administration in a large number of institutions 10 or 12 circular letters have been sent out during the academic year containing statements concerning various aspects of research in institutions of higher education. Returns from this correspondence indicate a distinct stimulation of the

support of research by the appropriation of research funds, the survey of local situations, the study of the vital relation of research to teaching, and increased attention upon research as a legitimate function of these institutions.

The annual meeting of the division was held in Washington on April 18.

DIVISION OF RESEARCH EXTENSION.

[H. E. HOWE, *Chairman.*]

(For present personnel, see Appendix A.)

Much of the work of the division of research extension requires a long time for its completion. The work of this division during the last half year has, therefore, been largely concerned with furthering matters initiated previously. Certain of these projects have originated with the division itself, while several others have had the attention of the division officers who serve as members of the promotion committee.

Critical tables of physical and chemical constants.—In this case, as in several other projects, industrial conditions have been a real handicap and have made rapid progress impossible. Of the $200,000 which is to form an underwriting fund, slightly more than 50 per cent has been secured in cash, pledges, and arrangements for service and materials which are the equivalent of money. A start has been made in the actual compilation of the material, the first work consisting in bringing together and classifying published tables which are to be considered as possible material for the critical tables. The organization work has proceeded steadily and the trustees have representatives in several industrial localities. These men are now engaged in giving information regarding the project and will later be active in an effort to secure the remaining funds.

In addition to the trustees representing the American Chemical Society, the American Physical Society, and the National Research Council, Mr. George P. Adamson has been selected to represent the Manufacturing Chemists' Association and Dr. Charles L. Reese to represent the American Dyes Institute on the board of trustees.

The advisory committee, which is to decide questions of editorial policy, has also been appointed by the council upon the nominations of the divisions of chemistry and chemical technology and of physical sciences. The committee has the following personnel:

John Johnston, Sterling professor of chemistry, Yale University, New Haven, Conn.

C. E. K. Mees, director of development and research, Eastman Kodak Co., Rochester, N. Y.

R. B. Moore, chief chemist and Chief Division of Mineral Technology, United States Bureau of Mines, Washington, D. C.

C. E. Mendenhall, department of physics, University of Wisconsin, Madison, Wis.

Saul Dushman, research laboratory, General Electric Co., Schenectady, N. Y.

G. K. Burgess, Chief Metallurgical Division, United States Bureau of Standards, Washington, D. C.

At present efforts are being made to find an editor who will be able to give full time to the work.

Crop Protection Institute.—The division of research extension had expected that before this the organization of the Crop Protection Institute would be completed and the council represented upon the board of governors by a member from some other division. However, the interest of new industrial groups in the affairs of the institute has been secured and the type of organization has been changed somewhat to make cooperation with these new interests feasible. Slight changes have been made in the constitution to guarantee the control of the institute being in the hands of the scientific members who now constitute a board of control with each industrial group having its own financial trustees. The institute now has some 300 members, of which 23 are classified as industrial and 21 associate-industrial members. The others are scientists.

The Association of Official Agricultural Chemists have now appointed their representatives upon the board of governors.

During this summer a cooperative experiment in dusting is being carried on in Virginia, West Virginia, New York, and Pennsylvania under the direction of Dr. N. J. Giddings as project leader.

Alloys.—The effort to form the Alloys Research Association, which is regarded by the division as an experiment in assembling and disseminating specialized knowledge through cooperative effort, continues to have the serious attention of the division. A prospectus of the project has been prepared and circulated widely. The replies indicate a real interest on the part of industry in the work. A number of subscriptions to the association have been received, but due to the present industrial situation it has not yet been possible to secure a sufficient number of subscriptions to initiate the service. With the return of normal conditions the representatives of the division will take the field in an effort to complete this project and begin the work as outlined.

Tanning.—The division has continued its investigation relative to the establishment of a school for tanning to be affiliated with an established university. The matter has been discussed with a large number of those interested and a definite plan for the undertaking developed. The officers of the division are now determining those schools interested in such work and qualified to carry out the plan. These will be considered with reference to their proximity to the

tanning centers and a report, with recommendations, prepared for the tanners' council for presentation at their next meeting.

Tobacco.—The project to support research looking to the development of better disease-resisting types of tobacco has not made the progress that had been expected. A few of the tobacco concerns have evidenced decided interest and some subscriptions have been obtained. The financial situation has not been encouraging to the growers, and it now appears that it will take more time before this work can be completed.

Glass.—The committee appointed by the American Ceramics Society to cooperate with this division obtained suggestions from a number of technical men in the industry relative to those projects upon which research in glass could be undertaken to advantage and, with their assistance, is now engaged in formulating a definite scientific program which will then be taken to the manufacturers themselves.

Textile research.—There have been a few important developments, especially with relation to research in cotton, and plans are now being formulated looking to the establishment of an American Textile Research Institute. Mr. D. E. Douty, who has served as the chairman of the preliminary committee on American cotton research, has found it necessary to resign, due to a long absence from the country, and the chairman of the division has been elected to succeed him.

The cooperation of the American Home Economics Association continues, and it is hoped that within a short time actual work can be begun upon their program looking to the establishment of minimum standards of wear for the principal fabrics in the wardrobe.

Electrodeposition.—After a conference with officials of the Bureau of Standards and with the approval of the division, work has been undertaken looking to increasing support given to the Bureau of Standards for research on the fundamentals of electroplating. The work of the division is being carried on with the assistance of the American Electroplaters' Society and interested individuals in industrial localties. It is hoped to secure the interest of a large number of manufacturers through an annual subscription of $100 each rather than appeal for larger funds from a smaller number.

Margarin.—In cooperation with the division of biology and agriculture assistance is being rendered the Independent Margarin Manufacturers' Association in formulating a plan for research which it is hoped the association will adopt and support.

Ceramics.—Important cooperative work is now in progress involving the Bureau of Mines, the Bureau of Standards, and associations composed of the manufacturers of heavy clay products. It is pro-

posed in time to extend this work to higher grade clay products, especially white ware.

Exhibits.—Following the policy of attracting attention to fundamental research through popular exhibits the division arranged for the cooperation of the Chemical Warfare Service, and a popular chemical exhibit was installed in the rooms of the council for several weeks. This exhibit was then shown in the Office Building of the House of Representatives and is now deposited in the United States National Museum. A duplicate of the exhibit has been shown in Philadelphia, Wilmington, and Springfield, and is later to appear in connection with the National Exposition of Chemical Industries in New York. A booklet was issued in connection with this exhibit, and a number of thousands of copies have been mailed throughout the country. Science Service has been of great assistance in securing favorable notice of this exhibit in the press.

Horological conference.—In May a horological conference was held at which the means to be taken to increase the attractiveness of watchmaking and repairing for younger men was discussed, as well as the stabilization of the watchmaking profession with special reference to the certification of watchmakers. In the conference, representatives of horological schools, of manufacturers, of merchants, the trade press, and various Government departments participated, and first steps were taken toward the formation of a Horological Institute of America, which will be concerned primarily with the scientific phases of time keeping with special reference to the mechanical devices necessary.

Georgia School of Technology.—The chairman of the division represented the council during the first week of April on a tour in the State of Georgia, undertaken to interest the people as a whole in the support of technical education and in the direct support of the Georgia School of Technology. This was viewed by the division as something of an experiment to see what could be done by this method in arousing the interest of a large number of laymen in technical education and in research pertaining thereto.

Miscellaneous.—Contact has been maintained with projects which have previously received the attention of the division, and preliminary work has been begun on the marine borer project and on the organization of research on corrosion. The division has continued to render such assistance as it could to individuals and organizations.

RESEARCH INFORMATION SERVICE.

[ROBERT M. YERKES, *Chairman.*]

(For present personnel see Appendix A.)

During the six months ending June 30, 1921, the activities of the research information service have been carried on by a resident

staff of 5 technical and 4 clerical members, working under the guidance of an executive committee of 7 and a consultant divisional committee of 38. The technical staff, when necessary, has called upon other resident members of the council for advice or assistance in matters pertaining to their respective fields.

The purpose of the service is to promote scientific and industrial research in this country through the operation of an active exchange for all kinds of scientific and technological knowledge. Questions have been answered concerning research problems, projects, work in progress, and results; methods and processes; laboratories, equipment, and apparatus; publication, funds, and personnel.

Approximately 675 requests for information on a wide range of scientific and technological subjects have been received by the research information service. In answering these requests, either the information desired was furnished by the service to the correspondent or sources from which it could be obtained were indicated. A complete record of each request, including the date, the information requested, sources consulted, and data furnished, has been entered on a card which is filed by subject. That inquirers have been obtaining helpful information is shown by return cards sent out to determine the value of replies made by the service. Of those returned, 97 per cent have reported that the information was useful.

In order to acquaint scientific workers with the availability of this "miscellaneous request service," a small eight-page folder, describing its function, scope, and basis of service, was issued early in 1921. This was printed in an edition of 19,000. About 4,000 copies were distributed among the fellows of the American Association for the Advancement of Science. The announcement was also sent to officials in American colleges and universities, directors of research in industrial laboratories, and to those listed as correspondents of the research information service. The remainder was put at the disposal of members of the council. The distribution of this folder resulted immediately in a marked increase in the number of inquiries received by the service.

To assist the staff of the research information service in answering requests, a file of informational sources is being developed. This file has been planned to include informational bureaus, individual specialists, special libraries, special laboratories, institutions, and firms which are recognized authorities on certain subjects. The value of this file in listing possible sources of information and in indicating those which are most satisfactory has been amply demonstrated.

Progress has been made in the collection of basic source books which are used for scientific reference. This collection includes dic-

tionaries, bibliographies, year books, directories, abstract journals, and reference books in special subjects. In connection with the source file, this library is particularly useful as a guide during the preliminary work on requests.

The service has continued its activities along the line of collecting and publishing important scientific information. The task of preparing for publication Bulletin No. 9, Funds Available in 1920 in the United States of America for the Encouragement of Scientific Research, has been completed. The list gives an account of medals, prizes, grants, and research scholarships and fellowships amounting in value to approximately $36,000,000 annually. New records concerning industrial research laboratories have been entered, and with the cooperation of the Chemical Catalogue Co. a final survey of the chemical industries is under way, preparatory to the publication of a second edition of "Research Laboratories in Industrial Establishments of the United States of America."

In cooperation with special libraries the service has also assisted Mr. W. I. Swanton, of the Reclamation Service, in preparing for publication a reference list of 170 Washington libraries. This list gives the location of the library, the name of the librarian, a general account of the subjects covered by each collection of books and the approximate number of volumes.

A card file of bibliographies has been initiated which will include all of the sciences, with their applications, and will cover all published material to date. In addition to published material, an attempt is being made in cooperation with the divisions of the National Research Council to compile a list of unpublished bibliographies in the United States. The information will include, besides the author, title, publisher, date and place of publication, the form of publication, the location of the bibliogprahy, and a brief annotation as to its scope. In the compilation of this bibliography of bibliographies the cooperation of specialists in each science will be enlisted. Work is under way on the lists for chemistry and geology. Whenever possible, copies of bibliographies are obtained and held on file in the Research Information Service. Photostats of rare publications are made for the benefit of those desiring copies.

A revision of the union list of periodicals in the District of Columbia, published in 1901 by the Library of Congress, has long been needed, and this work has lately been undertaken by the service with the cooperation of Mr. Meyer, chief bibliographer of the Library of Congress and the District libraries. The material is being brought to date and will include all serials regularly received in the District of Columbia as of July 1, 1921. Instead of canvassing the large libraries only, about 170 libraries have been asked to send in lists of their serials. The name of each library will appear in connection

with periodicals taken by it, if they are not available in at least four of the large libraries.

The service has started a survey of museums, academies, individuals, and commercial concerns in possession of lantern slides which may be borrowed, rented, or bought. The collection of information will not be limited to American agencies. A number of catalogues have already been received, and an index by subject has been started.

The file of research laboratories, furnishing essential information concerning scientific laboratories in which investigations are conducted, has been further enlarged. Many of these records were obtained by direct report from the laboratories. Revision and supplementation has continued slowly on the basis of information obtained from correspondence, available publications, and other sources. This file is maintained for the purpose of indicating the research interests, activities, and facilities of research laboratories.

Work on research personnel has centered chiefly about an experiment for mechanizing the information. The Findex system has been applied to one group of approximately 400 scientists. The research personnel file promises to become an important source of information for a number of scientific inquiries in addition to its more specific use in selecting lists of persons meeting particular requirements. In addition to research in personnel records, the service has a catalogue of 20,000 chemists and mining engineers which was compiled by the Bureau of Mines as an important war project.

The file of current investigations has been continued as an important supplement to other informational mechanisms. Facts about investigations in progress are continually noted but because of difficulties in actively seeking this kind of data and keeping them current, the file can never become complete. It is being gradually perfected, however, as other activities of the service develop. It has been found particularly useful for carrying details which can not be described in other informational files. The laboratory records, for example, reveal the general trend of research and the facilities in a particular center. Also the personnel record enumerates individual research projects which are under way. As additional details of particular current investigations become known, the facts are recorded as supplementary information in the current research file.

DIVISIONS OF SCIENCE AND TECHNOLOGY.

DIVISION OF PHYSICAL SCIENCES.

[AUGUSTUS TROWBRIDGE, *Chairman.*]

(For present personnel see Appendix A.)

The principal work of the division for the period January 1 to June 30, 1921, has been the maintenance and extension of the research

committees originally established during the chairmanship of Dr. Mendenhall. At present there are 18 such committees, with a total membership of 107. Of these committees three are in the field of astronomy, one in mathematics, and the remainder in the field of physics. Seven completed reports by these committees have so far been published or are now in press.

At the close of 1920 approximately $7,000 of the original grant of $20,000 from the Rockefeller Foundation for the maintenance of these committees reverted, but a new grant of $15,000 was made by the foundation for the maintenance of these committees during the year 1921. The committees which have been started at work under this new appropriation are in borderland fields between the subjects covered by the division of physical sciences and other divisions of the council.

The experiment of cooperative work being carried out through these research committees is, in the opinion of the chairman of the division, to be regarded as highly successful. The average cost per member per meeting of these committees is in the neighborhood of $30. The cost of publication of the reports will vary widely according to the size of the report. At least two of the committees intend to publish reports, the publication of which may not have to be borne by the funds of the council, since there is a demand for these reports sufficient to warrant a publishing house in financing the publications. These two reports will be, respectively, a Manual of Research Technique and a Manual on the Use of Statistics.

Other Activities.

In connection with the negotiations for the establishment of a scientific instrument journal, the division has withdrawn from the original attempt to have the journal conducted under the sole auspices of the National Research Council and has started direct negotiations between the instrument makers on the one hand and the Journal of the Optical Society of America on the other, looking toward the publication of the instrument journal under the auspices of this society. At present no financial support from the council to the joint enterprise is contemplated.

Two special projects of the division have received financial support to the amount of $500 each from the general funds of the council. These are the project of a revolving fund for securing the publication of mathematical monographs, and a contribution to the endowment fund which is being raised by the mathematical societies for the publication of mathematical abstracts. A third special project, namely, that of emergency support for the Journal of the American Mathematical Society, has received support from the council to the extent of $600.

During the past six months the chairman of the division of physical sciences, working in conjunction with the division of engineering, has organized an American section of the International Union of Scientific Radio-Telegraphy. France already has such a union, and it is expected that England, Italy, and Belgium will complete their organizations during the coming summer.

With the consent and, indeed, at the original suggestion of the Director of the United States Bureau of Standards, the division is endeavoring to devise some feasible method whereby the facilities of the bureau can be made available for wider utilization by research men. As a beginning in this undertaking the chairman of the division has been authorized to circularize the principal laboratories of physics of the country, stating the willingness of the Director of the Bureau of Standards to cooperate in special pieces of work, and inviting requests for such assistance to be sent to the chairman of the division.

Research Fellowship Board.

A considerable portion of the time of the chairman of the division has been devoted to the duties of the secretaryship of the research fellowship board. At the time of present writing (June 16) the number of fellows either holding fellowships or appointed to fellowships on which they will enter in the course of the next few months is 29, 10 of these in physics and the remaining 19 in chemistry. The number of applications for fellowships is steadily increasing, and the board feels that in the future it is desirable to arrange for personal interviews between the candidates and the secretaries of the board before the candidates' cases are brought before the board for final action.

DIVISION OF ENGINEERING.

[C. A. Adams, *Chairman.*]

(For present personnel, see Appendix A.)

Apart from the activities connected with specific projects, a brief account of which is given below, much of the time of the chairman during the past six months has been devoted to the establishment of the new plan of organization which involves the active participation of the engineering societies on the division.

This plan of organization which has been described more in detail in previous reports, has as its salient feature a general advisory board in each branch of engineering, which is sponsored by the appropriate society, and under which the several projects in that field are organized.

As in some cases this involves the reorganization of the research work of the societies and a closer coordination of that work with

the Division of Engineering, progress is necessarily slow; however, this work is progressing steadily and its completion will place the division in a much stronger position, with real working connections with the engineering societies which are represented on the division.

RECENT PROGRESS OF ACTIVE PROJECTS.

Heat treatment of carbon steel.—Funds for the conduct of this work up to the first of the year were provided by the United States Bureau of Mines and United States Bureau of Standards. Owing to the curtailment of the congressional appropriations for these bureaus, they are no longer able to render sufficient financial assistance. The National Research Council has therefore recently appropriated $1,000 which will be largely used for machining specimens. The services of Prof. Charles Y. Clayton, of the Missouri School of Mines, have been secured to assist Dr. Henry M. Howe in completing these investigations, his services to be paid for by the Bureau of Mines. A progress report will be published shortly which will contain the results obtained from the investigations up to date.

Fatigue phenomena of metals.—The original program provided for under the $30,000 appropriation of the Engineering Foundation has been completed, and considerable progress has been made on the extension of the investigations to study the fatigue properties of nickel-steel, which was financed by the General Electric Co.

The results of the investigations indicate that a rise of temperature test may furnish a reliable accelerated test for fatigue resistance. Although this test may not apply to alloy steels it seems to predict endurance limits for carbon-steel with accuracy, and a test can be completed in half an hour. Among the factors which lower the resistance of metals to repeated stresses may be mentioned:

(1) Sudden changes of the outline of the part.

(2) Localized stresses due to poor surface finish or to cracks in grooves caused by wear, by accidental blows, or by improper heat treatment.

(3) Occasional overload, either a heavy overload applied a few times or a light overload applied some thousands of times.

A report embodying the results of the investigations is now finished and will be published shortly. This report contains the most valuable and complete information ever published on this subject.

Other industries are taking an interest in this work as is also the Air Service of the War Department, and this is likely to permit further extension of the program.

New hardness testing machine.—This committee has summarized its work in a paper which will be published in the July issue of the American Society of Mechanical Engineers. The report contains a

great amount of test data obtained by the committee and also a very complete summary of available knowledge on this subject.

Steel ingots.—This committee was originally organized during the war to determine the best open-hearth practice for the manufacture of gun steels and fine steels generally, and to disseminate the information among the various manufacturers to the end of eliminating as far as possible numerous rejections, particularly on ordnance orders. The work has been completed and summarized in a report prepared by Dr. Henry M. Howe and Col. W. P. Barba, which will be published shortly. This report constitutes what is probably the best set of specifications for acid open-hearth practice ever prepared. Although the present activities of the committee have been completed there is a strong feeling that inasmuch as its membership constitutes the foremost experts on steel in the country, the committee should not be discharged.

Neumann bands.—The tests originally planned have been completed and a report will be published shortly. However, the work of this committee will be continued with a view to ascertaining whether the presence of Neumann bands is evidence of weakness of the metal, and the kinds of steel favorable for the production of Neumann bands.

Substitute deoxidizers.—The first phase of the work involving laboratory tests of fusibility and viscosity is finished, and the second dealing with the manufacture of the most promising mixtures and their try-out in steel making is well under way. A report will be published shortly embodying the results of investigations to date A number of large steel manufacturers have become interested in the work and have already rendered valuable assistance in the preparation of the deoxidizers, and in trying them out.

Specifications for standard tests for welds.—Difference in details of procedure for testing welds have caused such widely divergent results that comparisons are frequently impossible, with the result that the usefulness of much of the research work on record is greatly restricted.

A preliminary report, embodying the standardization of procedure for making tests of welds, has been completed and published in the proceedings of the American Welding Society.

Specifications for steel to be welded.—The quality and composition of the base or parent metal has an important bearing on the quality of the resultant weld. This committee is, therefore, devoting its activities to a study of existing specifications for steel, with a view to determining their suitability for welding purposes and modifying such existing specifications wherever necessary.

Electric arc welding, resistance welding, and gas welding.—These committees are confining their activities for the present to the prepa-

ration of critical summaries of existing knowledge and experience in the various branches of the welding field. The purpose of such summaries is to lay a sound foundation on which the much needed research may be properly planned.

Welding of storage tanks.—This committee was organized to meet the requests for information from the Standard Oil Co. as to the feasibility of welding storage tanks. Considerable difficulty has been experienced with the riveted tank, because such structures are not "oil-tight" for the lighter oils.

The result of this application of welding promises not only a cheaper but also a better storage tank, and will open a new and large field to which welding is particularly adapted. Several small tanks have already been built successfully in this way, although the designs were not specially adapted to welding. Specifications are in progress for the building of a large tank which will be constructed by the Standard Oil Co.

Training of welding operators.—The ultimate object of this committee is to draw up a standard for the training of welders which will meet the wide needs of the industry, varying from those of the manufacturer who is interested in one particular job to those at a shipyard and railroad, who are training men for all classes of work. Efforts for the present are confined to drawing up a set of questions designed for the special purpose of enabling the instructor to obtain a preliminary indication as to whether the prospective student has the necessary qualifications of becoming a good operator.

Welding wire specifications.—Specifications for welding wire by gas and electricity have been prepared by this committee for the welding of mild steel, and will be published shortly. Considerable progress has been made also in the preparation of specifications for a high-carbon electric-welding wire to meet the demands for the building up of worn surfaces where great resistance to abrasive wear is desired.

Core losses.—This committee was organized for the purpose of reducing core loss calculations of electrical machinery to a more rational basis. Four phases of this work are now being conducted at four universities—Harvard, Washington (St. Louis), Missouri, and Massachusetts Institute of Technology. Manufacturers have promised to cooperate and will furnish the services of their engineers and the facilities of their laboratories.

Highway advisory board.—Since the beginning of the year the advisory board on highway research, established through the activities of the division of engineering to organize a national program of highway research, has been seeking sufficient funds to employ a

director and provide for the necessary office expenses. These funds are now in sight, and Prof. W. K. Hatt of Purdue University has been engaged to take charge on July 1. The committee on economic theory of highway improvement, one of the committees coming under this board, has secured the cooperation of eight or nine State highway departments in conducting a number of research projects relating to this subject. It is estimated that in this way not less than $250,000 will be made available for this work during the coming year.

NEW PROJECTS.

Molding sand research.—In cooperation with the American Foundrymen's Association, the division is organizing an investigation on the reclamation of used sands in molding operations and for other foundry use. A well-planned investigation in this field will undoubtedly yield information which will result in an annual saving of millions of dollars. A bibliography has been prepared and progress is being made in preparing a critical summary of existing knowledge which will serve as a basis for drawing up a carefully selected research program. The financial support comes largely from the American Foundrymen's Association.

Welded rail joints.—Welding is being used very widely in making rail joints, and several of the large electric railway companies each spend over $100,000 a year for this work. More or less trouble from breakage has been experienced in all types of welding in commercial use, and although much experimental work has been carried out by individual companies (both manufacturers and users), no satisfactory solution has been obtained. Realizing this need, the American Electric Railway Engineering Association has appealed to the Amercan Bureau of Welding (the welding advisory board of the division of engineering) for assistance in organizing a rail-welding research, with the assurance that the necessary financial support will be provided by the electric railway companies and by the manufacturers of welding equipment, several of these companies having already promised such support.

The provisional organization committee has already had one meeting and the organization is under way.

Marine borer research.—Owing to the very sudden increase in the destruction of marine piling in San Francisco Bay resulting from the attack of marine borers, and amounting to about $15,000,000 in the last year or two, there was organized a San Francisco Bay Marine Piling Committee of the American Wood Preservers' Association. This committee prepared a very elaborate report covering all available knowledge concerning this subject. It has also established a

marine laboratory in San Francisco Bay for the purpose of furthering investigations, and has raised $30,000 for this purpose.

Realizing the danger of the spread of this activity to other parts of the coast line, the nation-wide importance of the problem and its solution and the need for the sponsorship of some recognized and unbiased national organization, the above-named committee appealed to the National Research Council for assistance in the organization of a national movement for the attack of this problem.

Accordingly a committee was appointed by the council, consisting of the chairmen of the divisions of engineering, of chemistry and chemical technology, and of biology and agriculture, to consider means for undertaking coordinated investigations upon the problem. This committee is now preparing a statement of the present situation in regard to the use of timber in marine construction and also a tentative program of investigations. It is hoped to secure the participation of all agencies concerned in the marine borer menace in carrying out this proposed extensive study.

This is one of the most important problems presented to the National Research Council since its organization and one of the best illustrations of the important service which can be rendered by a national body of this sort. It is also an excellent illustration of the need for cooperation between the scientific and engineering groups.

The problem is a decidedly imminent one and some attempt at a practical solution must be made immediately. This, however, does not preclude a more thorough investigation of the fundamentals involved looking toward the most effective and economical solution. Everything possible is being done to push this work along.

Revision of steam tables.—The best steam tables now available are recognized to be in error by a sufficient amount to warrant the very extensive research work necessary for a comprehensive revision. In fact, there are certain differences of opinion involving thermodynamic theory which can only be reconciled by careful experimental determination. Moreover, the present tables do not go high enough in temperature or pressure to meet the needs of modern steam engineering.

A movement is now under way to organize a national committee for this purpose, under the general advisory board on mechanical engineering of the division of engineering. This board is sponsored by the American Society of Mechanical Engineers. For the purpose of planning this organization a meeting of the most prominent steam engineers of the country was held in Cambridge, Mass., at the laboratory of the Harvard Engineering School, on Thursday, June 23. A report of the meeting will be available shortly. A small

part of this experimental work has already been completed at the laboratory of the Harvard Engineering School, a part of the expense being borne by the university and part by the American Society of Mechanical Engineers.

DIVISION OF CHEMISTRY AND CHEMICAL TECHNOLOGY.

[F. G. COTTRELL, *Chairman.*]

(For present personnel see Appendix A.)

The committee on synthetic drugs, Julius Stieglitz, chairman, has been inactive during the past few months owing to the fact that but very few inquiries have been received. From this it would seem that the manufacture of synthetic drugs in this country has now returned to a normal basis, and, on recommendation of the chairman, the committee will not be continued for the ensuing year.

The committee on methods of organic analysis, C. G. Derick, chairman, has confined its activities up to the present to an educational campaign carried out by a few addresses by members of the committee on the value of qualitative organic analysis. The committee is considering the publication of a brief laboratory manual on this subject, and Mr. S. P. Mulliken, of the Massachusetts Institute of Technology, is also continuing his very valuable methods of analysis for organic compounds. It is hoped to get the committee into active cooperation with various universities in order that the needed research may be completed on methods of separation of organic compounds and of their identification.

The committee on pharmaceutical research, J. M. Francis, chairman, has met with many perplexities and it is not ready as yet to report a definite program. It is expected that in the near future a committee will be named to outline a proper plan of procedure.

The committee on the chemistry of colloids, H. N. Holmes, chairman, has vigorously continued its activities initiated at the beginning of the year. A number of lectures have been given by members of the committee before universities and local sections of the American Chemical Society, and the attendance at these lectures indicates a growing interest in colloid chemistry. W. D. Bancroft has completed and published a stimulating textbook on "Applied Colloid Chemistry," and the chairman expects to have his "Laboratory Manual" ready for publishing soon. Suggestions that the committee act as clearinghouse for colloid chemists and manufacturers have brought ready response, but it would seem that the vigorous development of colloid chemistry in this country is too recent to have created an adequate supply of men needed. The classified bibliography, which has been in course of preparation for some time, will soon be issued in mimeograph form and distributed

for criticism and suggested additions, and a final edition will be published in some suitable manner later on. The list of 200 colloid problems, now being published in the Journal of Industrial and Engineering Chemistry, is another part of the general plan of the committee, and is calling forth decidedly interesting letters of inquiry.

The committee on ceramic research, Albert V. Bleininger, chairman, after a review of the present status of ceramic research, selected the following four subjects to receive the first attention: (1) A study of the elements which determine the plastic nature of clay; (2) a critical examination of certain methods used in silicate analysis; (3) a study of American pot clays and their proper compounding for the production of refractories used in the glass industry; (4) a study of the relationship between crazing and the expansion coefficients of bodies and glazes. These subjects were considered as especially promising and likely to attract the attention of the industries. The attitude of the makers of glass was very encouraging, and also of several firms engaged in the production of pots and blocks; but a number of other manufacturers of these clay products, however, declined to support the movement on the ground that such investigations should be conducted either with public funds, or, if supported privately, the results of the work should be kept confidential.

As several of the larger glass manufacturers had made their support contingent upon the cooperation of the manufacturers of glass house refractories, cooperative investigation did not appear promising and the matter was dropped for the time being. Manufacturers of pottery and other clay products were then approached with reference to the other subjects mentioned, but also with negative results. However, negotiations along these lines are still under way and it is believed that within the present year positive cooperation may result.

As the result of the efforts of the chairman of the committee a number of manufacturers of heavy structural clay products have become interested in cooperative research and an executive committee for several associations has been organized, and also a special technical committee; and a program has been outlined and the problems involved have been assigned to the members of the technical committee to be worked out in detail and specific plans outlined for attacking them. When this plan has been approved, research men will be employed who will have the status of fellows and will work at the various institutions under competent direction in prosecuting the investigation of specific problems. It is planned that the results of this cooperative research program shall be presented at the meetings of the heavy clay products division of the American

Ceramic Society, and this division will constitute a clearing house for the various associations of manufacturers in handling the work and making recommendations as to its continuance from year to year.

The committee on explosives investigations, Charles E. Munroe, chairman, has continued the work on problems initiated last year. As a result of its work on the utilization of surplus military explosives the entire surplus of T. N. T. (21,000,000 pounds) has now been distributed over a wide area, and though much of it has been used by the inexpert not a single accident from fire, explosion, or poisoning attending its use has been reported, while the reports of its behavior are quite enthusiastic. The tests by experts of the best methods of using picric acid (there being a surplus of 12,000,000 pounds to dispose of) have been made and instructions for tests in the field have been prepared, but it is not thought safe to look upon the instructions as final until the results of field tests by the inexpert under the supervision of experts, which are now under way, have been carried out on a large scale.

The committee has prepared translations of several publications deemed of special value; and a cooperative arrangement has been made between the Ordnance Department, United States Army, the Bureau of Ordnance of the Navy, and the Bureau of Mines under which a translation relative to explosives or a cognate subject prepared for one of them is manifolded for transmission through this committee to the others. A special feature this year is a review of the files of the Bureau of Mines and a carding of all the reports of investigations of accidents from or outrages committed with explosives made from the foundation of that bureau, so that in future investigations this material may be readily accessible.

No report has been received from the committee on sewage disposal, Edward Bartow, chairman, but the committee has been continued for the ensuing year.

At the annual meeting of the division, held at Rochester, N. Y., April 27, it was decided to undertake the publishing of a list of research chemicals in this country, and a committee representing the division of chemistry and chemical technology and the research information service was appointed, as follows: Messrs. W. D. Collins (chairman), Roger Adams, Capt. D. B. Bradner, Messrs. H. T. Clarke, W. F. Hillebrand, George C. Spencer, Clarence J. West (secretary). Mr. West has already entered upon his duties and some 500 letters have been sent out to manufacturing chemists throughout the country, and so far about 100 replies have been received; these replies will be assembled and a draft or bulletin will be submitted to the members of the committee for approval in due course.

At a meeting of the executive committee of the division, held in New York June 4, it was voted to take steps to secure the publication of information obtained through the development of our explosives industries and research connected therewith during the World War, and a committee representing the division of Federal relations and the division of chemistry and chemical technology was appointed for that purpose, consisting of Messrs. C. L. Alsberg, Charles E. Munroe, and Clarence J. West.

The following gentlemen have been appointed as delegates to the annual meeting of the International Union of Pure and Applied Chemistry, to be held at Brussels June 27, 1921: Messrs. F. G. Cottrell, E. S. Chapin, Frederick G. Keyes, Collin McCall, Hugh S. Taylor, and James B. Conant.

(With regard to progress in the matter of publication of critical tables of physical and chemical constants, see report of the division of research extension.)

DIVISION OF GEOLOGY AND GEOGRAPHY.

[EDWARD B. MATHEWS, *Chairman.*]

(For present personnel, see Appendix A.)

The outstanding features in the past six months in the division are: (1) The actual start of work on Mr. Wood's project for seismological study; (2) the completion of definite plans for cooperation between the American Geographical Society and the division in the publication of a series of maps of Africa; (3) the investigations of the committees of geography and sedimentation, presented at the annual meeting in April; (4) the completion and publication by the division of its investigations of the "status of geology and geography in the United States"; and (5) the beginning of a new office project, the collection of unpublished bibliographies on geology and geography. A brief summary of each of these to date follows:

1. PROJECT FOR SEISMOLOGICAL STUDY.

Early in 1919 Mr. H. O. Wood presented a very carefully considered scheme for seismological investigation. Prof. A. C. Lawson, of the University of California, also presented a somewhat similar project at a later date. After investigation by a committee of experts it was decided to push actively that portion of the project which dealt especially with southern California. Funds were not immediately forthcoming, but the Carnegie Institution of Washington early this year appointed Mr. Wood research associate and assigned him to this problem. Although the funds available are not as large as the plan originally called for, the division is exceedingly grateful to the institution for having made possible a start on the work. The region

is a key region in the study of earthquakes. The investigation is certain to show "how frequently shocks occur, and how strong they are" and "the places of origin of special hazard"; it ought to show "where earth strain is growing and how, and perhaps how fast and why." In time prediction of earthquake shocks may become possible. The work is expected, in any event, to "make significant contribution to the dynamics of geology and the physics of the earth."

2. Cooperation Between the Division and the American Geographical Society.

The American Geographical Society is one of the few strong instruments in this country for advancing geographical science. The division has been anxious to find ways in which it might be of assistance to this subject and finds in the publication of some of the results of the House "Inquiry" a very promising field of cooperation. An appropriation of $750 by the division and $1,000 by the society is at present being utilized in this work, the specific project at present under way being the preparation of general maps of Africa showing the distribution of soil types, vegetation zones, and land classification. These will represent "a great advance in accuracy and detail over former maps." It is hoped that the sale of these maps will provide a revolving fund for the publication of other maps embodying new knowledge.

The society has recently invited the cooperation of the division in a project calling for an examination and critical report on the condition of geographic science in the countries in Europe.

3. Work of Geography and Sedimentation Committees.

The committee on geography is interesting itself particularly at the present time in bringing about the production of a map of the United States more suitable than any extant for plotting the statistics of the Census Bureau in their relation to the physiographic divisions of the country. The smallest unit now employed by the bureau is the county, which is too gross to bring out these relations. If a township map were available it would be of great value, and the division is heartily seconding the efforts of the committee in its endeavor to procure such a map, especially for the northeastern United States where the difficulties of so doing are less. Already individual workers are awaiting the success of the project.

The committee on sedimentation has been making studies fundamental to opening the way for broad researches in sedimentation. In its recent report were presented outlines of studies in sedimentation being carried on in the universities of the United States, problems in sedimentation suggested by State geologists in response to a

questionnaire, a review of studies on sediments being carried on by Federal institutions, a bibliography of chemical and physical researches on sediments, an outline for the field description of sedimentary rocks, including suggestions for standardizing color description, and a full outline for a treatise on sedimentation.

4. Study of Status of Geology and Geography in the United States.

This study, which has been carried on in the office more or less intensively since July, 1920, was completed early in the year. The completed paper appears in the Bulletin of the Geological Society of America and as No. 17 of Reprint and Circular Series of the National Research Council.

5. Unpublished Bibliographies.

The division has recently inaugurated a new project, that of obtaining lists of unpublished bibliographies. A list of such bibliographies, made available by publication as soon as possible, should be of much value in preventing duplication of time by research students in the same field. Responses to a circular letter requesting information have been generous and all replies have been decidedly sympathetic to the idea. Several manuscript bibliographies of much value have already been discovered and the project gives promise of meeting a real need.

Various other activities of the division have been carried on as usual. Coordination of effort and cooperation between individuals and organizations have been fostered, and research students have been put in touch with others of similar interests. Probably at no time since its organization has the division been more successful in these types of activity. The chairman of the division has continued cooperation with the United States Board of Surveys and Maps, thereby keeping in close touch with both Government and public map requirements and problems.

Altogether the past six months are felt to have marked a considerable advance in the usefulness of the division.

DIVISION OF MEDICAL SCIENCES.

[G. W. McCoy, *Chairman.*]

(For present personnel see Appendix A.)

Owing to the splendid cooperation of the members of the executive committee of the division of medical sciences, it has been possible to carry on the work of the division for the half year with but a single meeting of the division. This meeting was held on April 11 in Washington. The work of the year was reviewed and the outlook for the future carefully canvassed.

It was the consensus of opinion of the members that while the larger projects of the division had not found financial support, the formulation of the projects was worth the time and effort given to it since there resulted the presentation of detailed plans for important work, which plans had secured the approval of the division.

A single large new project that contemplated the investigation of conditions affecting the health of people growing out of the prevailing undernutrition in central Europe was formulated by a committee of experts which met at Boston. This project called for an outlay of about $65,000 a year and had in view the carrying out of studies of metabolism, studies of epidemology, and infectious diseases and those of a psychological nature. Thus far no source of funds has been found.

A relatively small project for the aiding of studies in empyema has been given financial aid in the way of providing for financing studies on pathological material and for the analysis of X-ray findings now at the disposal of research workers through the courtesy of the Surgeon General of the Army. The division has participated in several activities jointly with the division of anthropology and psychology, as follows:

1. Conference on problems of the welfare of women and children which might profitably be studied in certain institutions in Washington.

2. Conference on the functions of the semicircular canals with special reference to tests for aviators.

3. Conference between selected groups of psychologists and psychiatrists with a view to promoting a better understanding of problems that fall on the border line between these groups of practitioners and if possible defining the field of each.

Provision has been made for a conference jointly with the division of biology and agriculture on contagious abortion of farm animals, a step of great economic importance, but related to the division of medical sciences only by reason of the affiliation of the American Veterinary Association with the division.

The chairman represented the division at the meeting of the Association for the Advancement of Science in Chicago in January and at the meeting of the American Medical Association in Boston in January.

DIVISION OF BIOLOGY AND AGRICULTURE.

[C. E. McCLUNG, *Chairman.*]

(For present personnel, see Appendix A.)

The activities of the division of biology and agriculture for the first six months of the calendar year 1921–22 have largely been a

continuation of efforts begun earlier. An analytical review of these has been made and will here be briefly considered.

1. In a study of the conditions under which biological and agricultural research is conducted in this country, there has spontaneously arisen in several instances the suggestion that the one thing most needed are research institutes free from the obligations of elementary instruction and from the requirements of immediately practical results. This matter was considered further by the division and provision made for a careful study of the problem.

2. Along with this consideration of a specific agency for promoting research there has come also in the case of several subjects a broad survey of present conditions and the formulation of programs for future development. Some of these are already resulting in definite accomplishment and will be referred to under other headings.

3. Such considerations led naturally to surveys of existing institutions. So far these have concerned only marine biological laboratories and inland aquatic laboratories. Recently, at a conference held at Fairport, Iowa, under the authority of the Department of Commerce, one session was given to a consideration of the development and correlation of inland laboratories. This matter will be pursued further, with the hope that a system of stronger institutions, concerned in each case with special subjects, may be developed.

4. Discussions of research conditions led naturally to the suggestion of other agencies for the promotion of research. Among these were mentioned a bureau of methods, files of current problems, standardization of biological reagents, establishment of a research fellowship system, and assistance to publications. A committee has been at work for more than a year on the problem of preparing and publishing lists of problems, and this has received favorable consideration by the division. Efforts to promote the standardization of biological reagents have not accomplished any definite results but will be continued. The committee on fellowships made a definite report recommending the policy of research fellowships both for the promotion of research and for the development of investigators. It is hoped that the money will be forthcoming for the inauguration of such a system. Continued efforts to secure support for publications have not yet been successful. However, it is hoped that within the next year progress will be made toward the establishment of a listing and bibliographical system under the auspices of the council.

5. The relation of the council to the industries is a subject which has been constantly up for study. As has been indicated in earlier reports, the division has been instrumental in helping in the establishment of a Crop Protection Institute, in providing the American Institute of Baking with scientific advice, in assisting the Mulford Expedition to South America, and in carrying out a study on the con-

tamination of food products. In several instances, industrial associations have approached the council for assistance in the development of research agencies and in carrying out specific investigations. These have all been sympathetically received.

6. One of the most difficult problems which the division has faced has been in securing assistance for individual investigators. There has always been some uncertainty about the desirability of doing this, but, as a matter of trial, several individual investigators have been assisted. So far these efforts have all resulted satisfactorily. In some instances the assistance has been provided by securing financial support for the individual and in others by securing from his institution relief from routine work so that he might devote himself to a special investigation.

7. Another form of assistance in research projects considered is that of cooperative effort in the solution of a particular problem. There has already been reported the study of physiological salt requirements of cultivated plants which is being continued and which promises to give definite scientific and practical results. There is also the case of the study of protein requirements of animals begun during the war. This has resulted in an extended report, a summary and discussion of which will soon be published by the council. In this case the collaborators will be free to publish from their own institutions the detailed results of their investigations, while the council, through the chairman of the committee, will publish the digest and summary. The cooperative study under the direction of the committee on forestry is proceeding actively and it is anticipated that valuable results will soon be ready for publication.

Naturally such cooperative investigations suggested themselves in relation to large comprehensive problems where the time and training of the individual investigator is not sufficient to enable him to accomplish the work desired. It would appear that in such cases as this the promotion of cooperative investigations should be one of the most valuable features of the council's work. Among such suggested investigations are those upon the conservation of meadows and pastures, oceanographic studies, and ecological study of the air. These are all under consideration and a committee has been provided for the last mentioned. The Ecological Society of America has a large committee which is making a study of existing areas of the country which it is desired to preserve for future biological study in an undisturbed condition. This committee has been actively at work for some time but its efforts have been crippled by a lack of financial support. Accordingly, on recommendation of the division of biology and agriculture, the council has provided money for the further prosecution of the work of this committee.

8. It was the hope that in establishing the council a definite means would be provided for better mutual understandings between workers in different fields of science. The various divisions of the council were set up so as to bring together the most nearly related sciences, thus providing for intimate association, and then means within the council were provided for contacts between representatives of these groups of science. The large amount of time required for organization within the divisions and for the council as a whole has in a way prevented the full development of relations between these different divisions. However, in several instances our division has entered into cooperation with the others of the council. There may be mentioned here the work with the division of research extension in forming the Crop Protection Institute and in providing the advisory board for the American Institute of Baking. Recently there has been occasion for cooperation with the engineering division and the division of chemistry and chemical technology in developing a project for the study of the marine borer in San Francisco Bay. With the cooperation of the division of physical sciences, also, there is arranged a conference on biophysics to be held at Woods Hole this summer. Outside of the council the particular contact of the division has been with the United States Department of Agriculture.

9. One of the most valuable features of the council's organization is the opportunity which it gives for bringing together groups of individuals particularly interested in some subject. Such conferences are essential to the full understanding of a problem and for the mutual adaptations between individuals required for their successful prosecution. Reference has already been made in previous reports to such conferences upon the condition of science in the Philippines, to conferences of committees on agronomy, horticulture, food and nutrition, fertilizers, and phytopathology. At the present time, in cooperation with the division of medical sciences, arrangements are being made for similar conferences upon the very serious animal disease called contagious abortion.

10. Another form of outside contact is with organizations having purposes similar to the council. Reference has already been made to the Second International Eugenics Congress to be held in New York in September of this year. This is now well organized and gives promise of being very successful. The Sigma Xi Society is an organization in universities devoted to the promotion of scientific research. For a number of years it has had under consideration a plan to establish a system of research fellowships. Lack of financial support has made this difficult to start, and so the council voted a small sum of money to get this under way. Already this has resulted in the collection of a sufficient sum of money to establish at

least two research fellowships comparable to those in physics and chemistry under the research fellowship board of the council. The Marine Biological Laboratory at Woods Hole is an outstanding example of cooperative effort within a scientific group, and because of this the council has lent its support in an effort to increase the facilities of the laboratory. While no definite results have been obtained as yet, there is reason to believe that eventually we should be able to assist this national cooperative laboratory.

11. The results of the war have placed upon American science increased responsibilities, especially in the matter of the publication of scientific work. Continued efforts have been made to assist in this matter, and the council has contributed directly to the support of Botanical Abstracts. Also it has made a small contribution to the Wistar Institute at Philadelphia to assist in the wider dissemination of certain zoological and anatomical journals which it published in the desire to extend more widely the influence of American biology and also to promote international good will by placing these journals for a time free of charge in laboratories where they would not otherwise go.

12. It was hoped that the establishment of the National Research Council, representing the scientific forces of the country, would provide a definite agency for giving expression to the collective judgments of scientific groups. In a measure the success of the council would be in the degree to which it was appealed to for an expression of such group judgments. Already there is satisfactory evidence that the council is thus recommending itself. Through the division of biology and agriculture it has been asked to express its judgment upon a number of important scientific projects which have sought financial support from different foundations.

DIVISION OF ANTHROPOLOGY AND PSYCHOLOGY.

[CLARK WISSLER, *Chairman.*]

(For present personnel, see Appendix A.)

This division has initiated a number of important conferences. two of which were held during the period—one conference on vestibular research and one on the relation of psychology to medical practice. Both were financed by an appropriation from the council amounting in the aggregate to $1,150.

The former revealed a distinct need for a standing committee, which was later authorized by the council. As now organized this committee comprises the leading investigators in this field, all of whom are actually engaged in research. For the support of these investigations the council has appropriated $1,400. Mention should also be made of the generosity of the University of California in

appropriating $400 for vestibular investigations by its representative on the committee. A number of other institutions have signified their intention to cooperate in the near future. The ultimate objective of the research is an understanding of the nervous mechanism by which equilibrium of the pilot of an airplane is maintained.

The conference on the relations of psychology to medicine was attended by six representatives of the medical profession and an equal number of psychologists, and concerned itself with the psychological training in medical schools and the legal status of psychological advisers and practitioners. This proved a very successful conference and promises to make for progress in this important problem.

During the interval the division was called upon to consider a number of extensive plans for research and make recommendations on the same. Since several of these requests referred to problems of fundamental importance, the division was able to render a real service.

The project for the prediction of success of students entering higher institutions was completed during the period, $500 having been appropriated by the council last year for that purpose. The project for the encouragement of research talent was taken up by the division of educational relations and will be reported under that head. The encouragement of State archæological surveys has proceeded under the direction of the special committee on that subject. Progress has been made in Indiana, Michigan, Iowa, and Illinois, the chairman of the division having held conferences with representatives from these States.

The annual meeting of the division was held on April 22, 1921.

APPENDIX A.

OFFICERS, MEMBERS, AND COMMITTEES.

Officers ane Executive Board.

OFFICERS.

Honorary chairman, George E. Hale, director of the Mount Wilson Observatory, Carnegie Institution of Washington, Pasadena, Calif.

Chairman, H. A. Bumstead,[1] professor of physics and director of the Sloane Physical Laboratory, Yale University, New Haven, Conn.

First vice chairman, Charles D. Walcott, Secretary of the Smithsonian Institution; president of the Academy of Sciences, Washington, D. C.

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[1] Deceased.

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[1] Deceased.

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[1] Deceased.

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A. L. Kroeber, curator of anthropology, Museum of Anthropology; professor of anthropology, University of California, Berkeley, Calif.

Berthold Laufer, curator of anthropology, Field Museum of Natural History, Chicago, Ill.

Clark Wissler, curator of anthropology, American Museum of Natural History, New York City.

AMERICAN PSYCHOLOGICAL ASSOCIATION.

James R. Angell, president of the Carnegie Corporation, 522 Fifth Avenue, New York City.

Raymond Dodge, professor of psychology, Wesleyan University, Middletown, Conn.

C. E. Seashore, dean of the graduate college, and professor of psychology, State University of Iowa, Iowa City, Iowa.

H. C. Warren, Stuart professor of psychology, Princeton University, Princeton, N. J.

J. B. Watson, Baltimore, Md.

G. M. Whipple, professor of experimental education, University of Michigan, Ann Arbor, Mich.

MEMBERS AT LARGE.

J. H. Breasted, professor of egyptology and oriental history, University of Chicago, Chicago, Ill.

S. I. Franz, scientific director, Government Hospital for the Insane, Washington, D. C.

P. E. Goddard, curator of ethnology, American Museum of Natural History, New York City.

L. M. Terman, professor of education, Leland Stanford Junior University, Stanford University, Calif.

E. L. Thorndike, professor of educational psychology, Teachers' College, Columbia University, New York City.

A. M. Tozzer, associate professor of anthropology and curator of middle American archeology and ethnology, Peabody Museum of American Archeology and Ethnology, Harvard University, Cambridge, Mass.

A representative of the division of Federal relations.

COMMITTEES.

Committee on anthropological and psychological study of the people of the United States: Chairman, Clark Wissler.

Committee on archeological survey of the States of Illinois, Indiana, Iowa, and Missouri: Chairman, R. B. Dixon.

State subcommittee for Indiana: Chairman, Amos W. Butler.

State subcommittee for Illinois: Chairman, Berthold Laufer.

State subcommittee for Iowa: Chairman, B. F. Shambaugh.

Committee on child welfare research: Chairman, Clark Wissler.

Committee on initiation of a journal of psychological abstracts (joint committee with the American Psychological Association): Chairman, C. E. Seashore.

Advisory committee on problems of military psychology: Chairman, Walter Dill Scott, Northwestern University, Evanston, Ill.

Committee on national intelligence tests: Chairman, G. M. Whipple.

Committee on nystagmus research: Chairman, Clark Wissler.

Committee on organized search for research talent among college students: Chairman, C. E. Seashore.

Committee on personnel research in business and industry: Chairman, Beardsley Ruml, assistant to the president of the Carnegie Corporation, 522 Fifth Avenue, New York City.

Committee on prediction of success of students entering higher institutions: Chairman, W. V. Bingham, professor of applied psychology, Carnegie Institute of Technology, Pittsburgh, Pa.

Committee on specific projects outside of the United States: Chairman, J. Walter Fewkes.

Committee of the National Association of Directors of Educational Research to cooperate with the division: Chairman, M. E. Haggerty, professor of educational psychology, University of Minnesota, Minneapolis, Minn.

Representative of the division on committee on health examinations of the American Physical Education Association: E. A. Hooton, Peabody Museum, Harvard University, Cambridge, Mass.

Research Fellowship Board.

A sum, amounting to $500,000 for the period May 1, 1919, to June 30, 1925, has been pledged to be appropriated by the Rockefeller Foundation to the National Research Council for the maintenance of National Research fellowships in physics and chemistry, under the direction of a research fellowship board appointed by the council of the National Academy of Sciences and the executive board of the National Research Council acting jointly.

The members appointed on this board serve for a period of five years. With them the chairmen of the divisions of physical sciences and of chemistry and chemical technology, appointed annually, serve in an ex officio capacity.

MEMBERS OF THE BOARD.

Simon Flexner, chairman, director of research laboratories, Rockefeller Institute for Medical Research, Sixty-sixth Street and Avenue A, New York City.

K. T. Compton, assistant professor of physics, Princeton University, Princeton, N. J.

George E. Hale, director of the Mount Wilson Observatory, Carnegie Institution of Washington, Pasadena, Calif.

Elmer P. Kohler, professor of chemistry, Harvard University, Cambridge, Mass.

R. A. Millikan, professor of physics, University of Chicago, Chicago, Ill.

A. A. Noyes, director of chemical research, California Institute of Technology, Pasadena, Calif.

EX OFFICIO.

F. G. Cottrell, chairman of the division of chemistry and chemical technology, National Research Council, Washington, D. C.

Augustus Trowbridge, professor of physics, Princeton University; chairman of the division of physical sciences, National Research Council; executive secretary of the research fellowship board for 1920–21, Washington, D. C.

Fellowships for 1920–21 have been awarded to the following persons, who have demonstrated a high order of ability in research, for the purpose of enabling them to conduct investigations at educational institutions which make adequate provision for research in physics and chemistry:

IN CHEMISTRY.

James A. Beattie
Arthur F. Benton
Francis W. Bergstrom
F. Russell Bichowsky
Frederick L. Browne
Emmett K. Carver
George L. Clark
Edwin J. Cohn
Roscoe G. Dickinson
Rolla N. Harger
Selig Hecht
Martin C. Henke
David C. Jones
Morris Kharasch
Albert G. Loomis
John P. Minton
Axel R. Olson
Henry C. Parker
Worth H. Rodebush

IN PHYSICS.

Ernest F. Barker
Gregory Breit
John S. Foster
Paul S. Helmick
Leonard B. Loeb
John P. Minton
George P. Paine
Henry DeW. Smyth
Louis T. E. Thompson
Joseph Valasek

APPENDIX B.

ARTICLES OF ORGANIZATION AS AMENDED UP TO JUNE 30, 1921.

PREAMBLE.

The National Academy of Sciences, under the authority conferred upon it by its charter enacted by Congress, and approved by President Lincoln on March 3, 1863, and pursuant to the request expressed in an Executive order made by President Wilson on May 11, 1918, adopts the following articles of organization for the National Research Council, to replace the temporary organization under which it has operated heretofore:

ARTICLE I—PURPOSE.

It shall be the purpose of the National Research Council to promote research in the mathematical, physical, and biological sciences, and in the application of these sciences to engineering, agriculture, medicine, and other useful arts, with the object of increasing knowledge, of strengthening the national defense, and of contributing in other ways to the public welfare, as expressed in the Executive order of May 11, 1918.

ARTICLE II—MEMBERSHIP.

SECTION 1. The membership of the National Research Council shall be chosen with the view of rendering the council an effective federation of the principal research agencies in the United States concerned with the fields of science and technology named in Article I.

SEC. 2. The council shall consist of representatives of national scientific and technical societies; representatives of the Government, as provided in the Executive order; and representatives of other research organizations and other persons whose aid may advance the objects of the council.

ARTICLE III—DIVISIONS.

SECTION 1. The council shall be organized in divisions of two classes: Divisions dealing with the more general relations and activities of the council, and divisions dealing with special branches of science and technology.

SEC. 2. The initial constitution of the divisions of the council shall be as follows:

Divisions of general relations: Division of Federal relations, division of foreign relations, division of States relations, division of educational relations, division of research extension, and research information service.

Divisions of science and technology: Division of physical sciences, division of engineering, division of chemistry and chemical technology, division of geology and geography, division of medical sciences, division of biology and agriculture, and division of anthropology and psychology.

SEC. 3. The number of divisions and the grouping of subjects in Article III, section 2, may be modified by the executive board of the National Research Council.

SEC. 4. The divisions of general relations shall be organized by the executive board of the National Research Council. (Art. IV, sec. 2.)

SEC. 5. To secure the effective federation of the principal research agencies in the United States, provided for in Article II, a majority of the members of each of the divisions of science and technology shall consist of representatives of scientific and technical societies, who shall be chosen as provided for in Article V, section 2. The other members of the division shall be nominated by the executive committee of the division, approved by the executive board of the National Research Council, and appointed in accordance with Article V, section 4.

SEC. 6. The divisions of the council, with the approval of the executive board, may establish sections and committees, any of which may include members chosen outside the membership of the council.

ARTICLE IV—ADMINISTRATION.

SECTION 1. The affairs of each division shall be administered by a chairman, one or more vice chairmen, and an executive committee, of which the chairman and vice chairmen shall be ex officio members. The officers and the executive committee of each of the divisions of general relations shall be appointed by the executive board for such periods as may be determined by the board, except that the foreign secretary of the National Academy of Sciences shall be ex officio chairman of the division of foreign relations. The officers and executive committee of each of the divisions of science and technology shall be elected by the division at its annual meeting and confirmed by the executive board.

SEC. 2. The affairs of the National Research Council shall be administered by an executive board, of which the officers of the National Research Council, the president and home secretary of the National Academy of Sciences, the president of the American Association for the Advancement of Science, the chairmen and vice chairmen of the divisions of science and technology, and the chairmen of the divisions of general relations shall be members ex officio. In the absence of the chairman of a division the vice chairman or other executive officer shall represent him. The council of the National Academy of

Sciences and the executive board of the National Research Council, acting jointly, may nominate additional members, not to exceed 12 in number, who, if not already members of the National Research Council, shall be appointed thereto by the president of the National Academy of Sciences for terms of three years. Upon their retirement chairmen of the National Research Council shall continue as members of the executive board for two years beyond the period of their appointment. Subject to the approval of the executive board the business of the council may be transacted by an interim committee constituted as defined in the by-laws.

SEC. 3. The officers of the National Research Council shall consist of a chairman, a chairman of the executive board, one or more vice chairmen, a permanent secretary, and a treasurer, who shall also serve as members and officers of the executive board of the council.

SEC. 4. The officers of the National Research Council, excepting the permanent secretary and the treasurer, shall be elected annually by the executive board. The permanent secretary of the council shall be elected by the executive board for a period of one year or more. The treasurer of the National Academy of Sciences shall be ex officio treasurer of the National Research Council.

SEC. 5. The duties of the officers of the council and of the divisions shall be fixed by the executive board.

ARTICLE V—NOMINATIONS AND APPOINTMENTS.

SECTION 1. The Government bureaus, civil and military, to be represented in the division of Federal relations and the scientific and technical societies, to be represented in the divisions of science and technology of the National Research council, shall be determined by joint action of the council of the National Academy of Sciences and the executive board of the National Research Council.

SEC. 2. Representatives of scientific and technical societies shall be nominated by the societies, at the request of the executive board, and appointed by the president of the National Academy of Sciences to membership in the council and assigned to one of its divisions.

SEC. 3. The representatives of the Government shall be nominated by the president of the National Academy of Sciences after conference with the secretaries of the departments concerned, and the names of those nominated shall be presented to the President of the United States for designation by him for service with the National Research Council.

SEC. 4. Other members of the council shall be nominated by the executive committees of the divisions, approved by the executive board, and appointed by the president of the National Academy of Sciences to membership and assigned to one of the divisions.

SEC. 5. Members of the council shall be appointed for terms of three years, except when appointed to fill unexpired terms.

SEC. 6. The Government representatives shall serve for periods of three years, unless they previously retire from the Government office which they represent, in which case their successors shall be appointed for the unexpired term.

ARTICLE VI—MEETINGS.

SECTION 1. Meetings of the council may be held on call of the executive board.

SEC. 2. The executive board and the divisions shall hold annual meetings, at which, in the case of the divisions of science and technology, officers shall be elected; such other meetings may be called as may be required for the transaction of business. The annual meeting of the executive board shall be held in

April in the city of Washington, on a date to be determined as the board may direct.

SEC. 3. Joint meetings of the executive board of the National Research Council and the council of the National Academy of Sciences shall be held from time to time, to consider any matters which, in the judgment of the president of the National Academy, require the attention of both bodies.

ARTICLE VII—PUBLICATIONS AND REPORTS.

SECTION 1. An annual report on the work of the National Research Council shall be presented by the chairman to the National Academy of Sciences for submission to Congress in connection with the annual report of the president of the academy.

SEC. 2. Other publications of the National Research Council may include papers, bulletins, reports, and memoirs, which may appear in the proceedings or memoirs of the National Academy of Sciences, in the publications of other societies, in scientific and technical journals, or in a separate series of the Research Council.

ARTICLE VIII—AMENDMENTS.

SECTION 1. Power of amendment of these articles of organization shall reside in the council of the National Academy of Sciences.

ANNUAL REPORT OF THE TREASURER.

[January 1 to June 30, 1921.]

To the President of the National Academy of Sciences:

I have the honor to submit the following report as treasurer of the academy for the six months' period from January 1 to June 30, 1921, and as treasurer of the National Research Council for the same period. At the autumn meeting of the academy, held in November, 1920, the constitution and rules were amended so as to change the termination of the fiscal year from December 31, as heretofore, to June 30. This report is divided into two sections, the first covering the accounts of the National Academy of Sciences and the second covering those of the National Research Council.

NATIONAL ACADEMY OF SCIENCES.

The total income of the academy from gifts, dues, interest on investments, subscriptions, and contributions to proceedings amounted to $25,775.16. The miscellaneous disbursements amounted to $12,846.35, and payments on grants and for medals from trust funds amounted to $5,304.92.

The total book value of the investments held by the academy on June 30, 1921, was $256,051.50, yielding interest at that date at the rate of 5.27 per cent on the sum named. The market value of these investments on June 30, 1921, as nearly as could be determined, was $222,363.08 and the interest rate as computed on that sum was 6.07 per cent.

A gift of $400 was received from Mrs. Mary Clark Thompson, which was in addition to the $11,000 contributed by her during the year 1919. The additional sum was to provide for the award this year of the Mary Clark Thompson gold medal, which otherwise would not have been possible.

Special contributions, chiefly from members of the academy and amounting to $3,171, were secured through the efforts of Dr. Charles D. Walcott for the purpose of financing in a more satisfactory way the cost of publishing the Proceedings of the academy.

The capital of the Bache fund was increased by $1,000, making a total now for that fund of $60,000, by action of the directors of the Bache fund in transferring the sum of $1,000 from income to capital.

Changes in the investments may be summarized as follows: Loans on real estate aggregating $9,000 were paid at maturity. Nine bonds of a total face value of $6,700 were purchased for $6,465.50.

The consolidated investment fund now totals $175,745.50, an increase of $1,000 having been made since the last report by the increase in the capital of the Bache fund.

TRUST FUNDS OF THE ACADEMY.

The trust funds of the academy, the income of which is administered for specific purposes, are enumerated below. The capital of certain funds has been increased beyond the amount of the original gift or bequest by the transfer of accumulated income at the request of the donors or by action of the academy.

Bache fund: Bequest of Alexander Dallas Bache, a member of the academy, 1870. To aid researches in physical and natural sciences	$60,000.00
Watson fund: Bequest of James C. Watson, a member of the academy, 1874. For the promotion of astronomical science through the award of the Watson gold medal and grants of money in aid of research	25,000.00
Draper fund: Gift of Mrs. Henry Draper, 1883. In memory of her husband, a former member of the academy. To found the Henry Draper gold medal, to be awarded for notable investigations in astronomical physics. The balance of income is applied to air research in the same science	10,000.00
Smith fund: Gift of Mrs. J. Lawrence Smith, 1884. In memory of her husband, a former member of the academy. To found the J. Lawrence Smith gold medal, to be awarded for important investigations of meteoric bodies and to assist, by grants of money, researches concerning such objects	10,000.00
Gibbs fund: Established by gift of Wolcott Gibbs, a member of the academy, 1892, and increased by a bequest of the late Morris Loeb, 1914. For the promotion of researches in chemistry	5,545.50
Gould fund: Gift of Miss Alice Bache Gould, 1897. In memory of her father, a former member of the academy. For the promotion of researches in astronomy	20,000.00
Comstock fund: Gift of Gen. Cyrus B. Comstock, a member of the academy, 1907. To promote researches in electricity, magnetism, or radiant energy through the Comstock prize of money, to be awarded once in five years for notable investigations. The fund is to be increased, ultimately, to $15,000	12,406.02
Marsh fund: Bequest of Othniel Charles Marsh, a member of the academy, 1909. To promote original research in the natural sciences. To the original bequest of $10,000 the academy has added interest received from the estate and has authorized the increase of the fund to $20,000 by annual additions from income	20,000.00
Murray fund: A gift from the late Sir John Murray, 1911. To found the Alexander Agassiz gold medal, in honor of a former member and president of the academy, to be awarded for original contribution to the science of oceanography	6,000.00
Hartley fund: A gift from Mrs. Helen Hartley Jenkins, 1913–14, in memory of her father, Marcellus Hartley, to found the medal of the academy awarded for eminence in the application of science to the public welfare	1,200.00

Billings fund: Established by the bequest of Mrs. Mary Anna Palmer Draper (Mrs. Henry Draper) of $25,000, 1915. To support the publication of the proceedings of the academy or for other purpose, to be determined by the academy, three installments	$5,000.00
Elliot fund: Gift of Margaret Henderson Elliot, to found the Daniel Giraud Elliot gold medal and honorarium for the most meritorious work in zoology or paleontology published in each year	8,000.00
Thompson fund: Gift of Mrs. Mary Clark Thompson, 1919, the income thereof to be applied for a gold medal of appropriate design to be awarded annually by the academy for the most important services to geology and paleontology, the medal to be known as the Mary Clark Thompson gold medal	10,000.00
In addition to the above-named funds the academy holds the following: Agassiz fund—bequest of Alexander Agassiz, a member of the academy, 1910, for the general uses of the academy	50,000.00
Total	243,151.52

Statement of assets and liabilities, June 30, 1921.

ASSETS.

	Face value.	Book value.	Market value June 30, 1921.
1. Mortgage notes, secured by first mortgages on real estate	$21,500.00	$21,500.00	$21,500.00
2. BONDS—			
(Bonds purchased during the year are indicated thus *.)			
American Telephone & Telegraph Co., 30-year, 5 per cent, gold collateral trust, due Dec. 1 1946; Nos. 4604, 29245, 29246, 41419; 4 at $1,000	4,000.00	3,817.50	3,280.00
Asheville Power & Light Co., first mortgage, 30-year gold, 5 per cent, due Apr. 1, 1942, New York; Nos. 272, 490, 492, 508, 509; 5 at $1,000	5,000.00	4,892.50	3,750.00
Broadway Realty Co., purchase money, first 5 per cent gold, due Sept. 1, 1926; Nos. 50, 796, 963–965, 1068, 1616–1620, 1102, 1139, 1629, 1630; 15 at $1,000	15,000.00	14,930.00	12,750.00
Bush Terminal Buildings Co., first mortgage 50-year sinking fund, 5 per cent, gold, due Apr. 1, 1960; Nos. 1383–1387 and 2805–2809; 10 at $1,000	10,000.00	9,375.00	7,400.00
Chesapeake & Ohio, general mortgage, 4.5 per cent, gold, due New York, Mar. 1, 1992; Nos. 15350–15354; 5 at $1,000	5,000.00	4,600.00	3,650.00
City of Tacoma, Green River special water fund No. 2, 5 per cent, due Oct. 1, 1939; Nos. 1508–1511; 4 at $1,000	4,000.00	4,140.00	3,400.00
Cleveland Electric & Illuminationg Co., first mortgage, 5 per cent, gold, due New York, Apr. 1, 1939; Nos. D261–D264; 4 at $500; and Nos. M6060, M6096, M6097, M15094–M15098; 8 at $1,000	10,000.00	9,597.50	8,500.00
Commonwealth Electric Co., first 5 per cent, due June 1, 1943; Nos. 2945–2947, 4011; 4 at $1,000	4,000.00	3,600.00	3,160.00
Cosmos Club, 4.5 per cent, due July 1, 1949; Nos. 286–289, 290–294, 296, 297, 299, 301, 303–305, 350; 17 at $1,000	17,000.00	17,000.00	12,750.00
Detroit Edison Co., first and refunding mortgage, gold, 5 per cent, due Jan. 1, 1940; Nos. 9657–9660; 4 at $1,000, and Nos. D501, D502, D599; 3 at $500	5,500.00	5,005.00	4,290.00

Statement of assets and liabilities, June 30, 1921—Continued.

ASSETS—Continued.

	Face value.	Book value.	Market value June 30, 1921.
2. BONDS—Continued.			
Detroit Edison Co., first mortgage, 30-year gold, 5 per cent, due Jan. 1, 1933; Nos. 557, 2442, 2443, 3024, 3252, 3253, 3639–3641, 8086; 10 at $1,000	$10,000.00	$10,072.50	$8,800.00
Dominion Coal Co. (Ltd.), first mortgage, sinking fund, gold, 5 per cent, due New York, Mar. 1, 1940; Nos. A1037–A1039; 3 at $1,000	3,000.00	2,718.75	2,340.00
Galveston, Harrisburg & San Antonio, Mexican and Pacific Ex., 6 per cent, second guaranteed; reduced to 5 per cent, due Jan. 1, 1931; Nos. 1044, 1048, 1248, 2112–2116; 8 at $1,000	8,000.00	8,030.00	6,560.00
Georgia Ry. & Electric Co., first consolidated mortgage, 5 per cent, sinking fund, gold, due Jan. 1, 1932; Nos. 191, 1061, 1600; 3 at $1,000	3,000.00	2,995.00	2,430.00
Government of the Province of Alberta, 4.5 per cent, 10-year gold debenture, due New York, Dec. 1, 1923; Nos. 1501–1511; 11 at $100, and Nos. 2031, 2032; 2 at $500	2,100.00	2,012.25	1,869.00
Government of the Province of Alberta, 4.5 per cent, 10-year gold debenture, due New York, Feb. 1, 1924; No. 2620; 1 at $500	500.00	470.00	445.00
Government of the Province of Alberta, 5 per cent, 10-year gold debenture, due New York, May 1, 1925; No. 2364; 1 at $1,000, and Nos. O189B–O193B; 5 at $500	3,500.00	3,380.00	3,150.00
Grand Rapids Gas Light Co., 5 per cent, first mortgage, gold, due New York, Aug. 1, 1939; Nos. A522, A523, A595, A596; 4 at $1,000	4,000.00	4,020.00	3,400.00
Great Northern Ry. Co.,* 7 per cent, 15-year general mortgage, series A, due July 1, 1936; temporary certificates; Nos. TM67750–TM67755; 6 at $1,000; TC4849, TC4850; 2 at $100; TD3817; 1 at $500	6,700.00	6,465.50	6,465.50
Hydraulic Power Co. of Niagara Falls, 5 per cent, refunding and improvement mortgage, due Oct. 1, 1951; Nos. D457, D458, D244; 3 at $500	1,500.00	1,320.00	1,200.00
Liberty, third loan, 4¼ per cent, gold, of 1928; Nos. 8239, at $10,000; Nos. 2643499–2643523; 25 at $100; and Nos. 4070782–4070787; 6 at $50.	12,800.00	12,800.00	11,617.28
Liberty, fourth loan, 4¼ per cent, gold, of 1933–1938; Nos DO4770174; EO4770175; 2 at $100	200.00	200.00	173.80
Michigan Northern Power Co., first mortgage guaranteed, 5 per cent, due 1941; Nos. 5054, 5057, 5216, 5516, 5567–5571, 8515; 10 at $1,000; and Nos. 4367, 4368; 2 at $500	11,000.00	9,540.00	8,250.00
Milwaukee Electric Ry. & Light Co., 5 per cent, general and refunding mortgage, gold, series A, due New York, Dec. 1, 1951; Nos. 2088, 2772, 3830, 3840, 3930, 3931, 5222–5224; 9 at $1,000	9,000.00	8,237.50	6,210.00
Minneapolis General Electric Co., 5 per cent, 30-year, gold mortgage, due New York, Dec. 1, 1934; Nos. 1621, 1622, 1949, 2004, 2572–2575, 7579, 7580; 10 at $1,000	10,000.00	9,880.00	8,700.00
Niagara Falls Power Co., first mortgage, 5 per cent, gold, coupon, due Jan. 1, 1932; Nos. 5246, 5247, 6583, 8358; 4 at $1,000	4,000.00	4,100.00	3,440.00
Niagara Falls Power Co., first mortgage, 5 per cent, gold, registered, due Jan. 1, 1932; No. R484; 1 at $6,000	6,000.00	5,760.00	5,160.00
Riggs Realty Co., 3–30-year coupon, first, 5 per cent, due Washington, D. C., Oct. 1, 1940; Nos. 124, 128, 132, 136, 140, 144; 6 at $1,000	6,000.00	6,195.00	5,520.00
Shawinigan Water & Power Co., 5 per cent, consolidated mortgage, 30-year, gold, due Jan. 1, 1934; Nos. MO354, MO510, M2894, M2943; 4 at $1,000	4,000.00	3,822.50	3,480.00

Statement of assets and liabilities, June 30, 1921—Continued.

ASSETS—Continued.

	Face value.	Book value.	Market value June 30, 1921.
2. BONDS—Continued.			
Southern Bell Telephone & Telegraph Co., 30-year first mortgage, 5 per cent, sinking fund, gold, due Jan. 1, 1941; Nos. M9739, M11576–M11579, M13965, M15568–M15570; 9 at $1,000	$9,000.00	$8,942.50	$7,200.00
Swiss Government, 8 per cent, due July 1, 1940; No. 3400; 1 at $1,000	1,000.00	1,000.00	1,045.00
Trinity Buildings Corporation, first mortgage, gold, 5½ per cent, due 1939; Nos. M5229–M5243; 15 at $1,000; and Nos. D697–D706; 10 at $500	20,000.00	19,900.00	18,000.00
Two Rector Street Corporation, first mortgage, 15-year, sinking fund, gold loan, 6 per cent, due Apr. 1, 1935; No. M300; 1 at $1,000; No. D152; 1 at $500	1,500.00	1,500.00	1,327.50
Union Electric Light & Power Co., of St. Louis, 5 per cent, first mortgage, 30-year, gold, due New York, Sept. 1, 1932; Nos. 1352, 4169, 8601, 3821; 4 at $1,000	4,000.00	3,782.50	3,280.00
United Kingdom of Great Britain and Ireland, 10-year, 5½ per cent, due Aug. 1, 1929; Nos. M138584–M138599; 16 at $1,000	16,000.00	15,400.00	14,120.00
Vicksburg, Shreveport & Pacific R. R. Co., prior-lien mortgage, at 6 per cent, gold, renewed at 5 per cent, due Nov. 1, 1915, extended to Nov. 1, 1940; Nos. 561, 661, 794, 982, 1323; 5 at $1,000	5,000.00	5,050.00	3,750.00
Total	262,800.00	256,051.50	222,363.08

SUMMARY.

Book value of mortgage notes as above	$21,500.00
Book value of bonds as above	234,551.50
	256,051.50
Bank balance June 30, 1921	21,280.50
Total	277,332.00

LIABILITIES.

	Income.	Capital.		Income.	Capital.
General fund, uninvested	$973.91		Draper fund:		
Agassiz fund, invested		$50,000.00	Invested	$917.50	$10,000.00
Bache fund:			Uninvested	655.66	
Invested		60,000.00	Elliot fund:		
Uninvested	1,234.39		Invested	300.00	8,000.00
Billings fund, invested	50.00	5,000.00	Uninvested	674.96	
Building site:			Gibbs fund:		
Invested	2,240.00		Invested	500.00	5,545.50
Uninvested	479.95		Uninvested	36.89	
Comstock fund:			Gould fund:		
Invested	500.00	12,265.00	Invested	7,010.00	17,992.50
Uninvested	1,601.68	141.02	Uninvested	897.72	2,007.50
Consolidated fund, uninvested	1,310.25		Hale lectureship:		
			Invested	200.00	
			Uninvested	44.83	

Statement of assets and liabilities, June 30, 1921—Continued.

LIABILITIES—Continued.

	Income.	Capital.		Income.	Capital.
Hartley fund:			Thompson fund:		
Invested		$1,200.00	Invested		$10,000.00
Uninvested	$130.68		Uninvested	$20.86	
Marsh fund:			Watson fund:		
Invested	$150.00	$20,000.00	Invested	1,780.00	24,976.25
Uninvested	1,215.09		Uninvested	1,104.71	23.75
Murray fund:					
Invested	400.00	6,000.00	Grand total	34,180.48	243,151.52
Uninvested	777.23				
Proceedings:			Consolidated investment fund:		
Academy account, uninvested	1,125.76		Invested		174,227.75
Joint account, uninvested	1,977.42		Uninvested	1,310.25	1,517.75
Emergency fund proceedings, uninvested	2,040.00		Total	1,310.25	175,745.50
Smith fund:					
Invested	2,542.50	10,000.00			
Uninvested	1,288.49				

Condensed statement of receipts and expenditures, Jan. 1 to June 30, 1921.

RECEIPTS.

Balance, Jan. 1, 1921, as per last report			$13,656.61
Cash receipts:			
Academy Proceedings—			
Annual dues	$1,035.00		
Subscriptions	167.00		
Reprints and separates	465.57		
Special contributions secured by Dr. Chas. D. Walcott	3,171.00		
National Research Council, for space	832.48		
		$5,671.05	
Joint Proceedings—			
Subscriptions	453.39		
National Research Council	1,250.00		
National Academy of Sciences	1,250.00		
		2,953.39	
General fund—			
Annual dues	660.00		
		660.00	
Thompson fund:			
Additional contribution by Mrs. Mary Clark Thompson		400.00	
Total income from investments		7,090.72	
Mortgage notes paid		9,000.00	
			25,775.16
Book transfers, distribution of consolidated			4,847.25
Total			44,279.02

EXPENDITURES.

Book transfers, distribution of consolidated			$4,847.25
Cash expenditures:			
Investment of capital		$6,465.50	
Blue prints, and sign, building site		81.16	
			6,546.66
Payments from trust and other funds:			
Bache fund—			
W. Lindgren, grant	$300.00		
Gilbert N. Lewis, grant	500.00		
Frank P. Underhill and Lafayette B. Mendel, grant	200.00		
		1,000.00	
Draper fund—			
William Bowie, grant	200.00		
Gold medal	208.60		
		408.60	
Elliot fund, honorarium and gold medal		401.78	
Gibbs fund, R. L. Datta, grant		200.00	
Gould fund—			
The Astronomical Journal, grant	500.00		
William Bowie, grant	150.00		
		650.00	
Hartley fund, gold medal		69.70	
Marsh fund—			
Anna M. Tolhurst, grant	$100.00		
Carl O. Dunbar, grant	300.00		
W. J. Sinclair, grant	400.00		
		800.00	
Murray fund, medal		9.27	
Smith fund, S. A. Mitchell, grant		500.00	
Thompson fund—			
Proof medal by artist	$350.00		
Gold medal	415.57		
		765.57	
Watson fund, John A. Miller, grant		500.00	
			5,304.92
Academy Proceedings:			
Printing and distributing		1,763.24	
Expenses—			
Boston office		70.00	
Washington office		39.29	
Transferred from academy proceedings to joint proceedings, representing the contribution by the National Academy of Sciences		1,250.00	
			3,122.53
Joint Proceedings:			
Salary, managing editor		375.00	
Printing and distributing		366.11	
Expenses—			
Boston office		105.00	
Washington office		129.86	
			975.97

General fund:		
Salary, assistant secretary	$450.00	
Home secretary's office	829.88	
Treasurer's office	158.75	
Memoirs, printing, etc.	88.55	
Meeting, annual	610.90	
Election of members	63.11	
		$2,201.19
		22,998.52
Balance, June 30, 1921		21,280.50
Total		44,279.02

Accounts with individual funds Jan. 1 to June 30, 1921.

	General fund.		Agassiz fund.	
	Income.	Capital.	Income.	Capital.
Balance Jan. 1, 1921:				
Cash	$1,128.30			
Invested				$50,000.00
Receipts:				
Interest on investments	1,386.80			
Annual taxes	660.00			
Total	3,175.10			50,000.00
Disbursements:				
General expenses	2,201.19			
Balance June 30, 1921:				
Cash	973.91			
Invested				50,000.00
Total	3,175.10			50,000.00

	Bache fund.		Billings fund.	
	Income.	Capital.	Income.	Capital.
Balance Jan. 1, 1921:				
Cash	$1,597.96			
Invested		$59,000.00	$50.00	$5,000.00
Receipts:				
Interest on investments	1,636.43		139.70	
Transfer from income to capital		1,000.00		
Total	3,234.39	60,000.00	189.70	5,000.00
Disbursements:				
Grants	1,000.00			
Transfer to Proceedings			139.70	
Transfer from income to capital	1,000.00			
Balance June 30, 1921:				
Cash	1,234.39			
Invested		60,000.00	50.00	5,000.00
Total	3,234.39	60,000.00	189.70	5,000.00

Accounts with individual funds Jan. 1 to June 30, 1921—Continued.

	Building site.		Comstock fund.	
	Income.	Capital.	Income.	Capital.
Balance Jan. 1, 1921:				
Cash	$248.61		$1,287.77	$141.02
Invested	2,240.00		500.00	12,265.00
Receipts, interest on investments	312.50		313.91	
Total	2,801.11		2,101.68	12,406.02
Disbursements, plats, blue prints, and sign	81.16			
Balance June 30, 1921:				
Cash	479.95		1,601.68	141.02
Invested	2,240.00		500.00	12,265.00
Total	2,801.11		2,101.68	12,406.02

	Consolidated fund.		Draper fund.	
	Income.	Capital.	Income.	Capital.
Balance Jan. 1, 1921:				
Cash	$1,441.00	$0.75	$762.00	
Invested		174,744.75	917.50	$10,000.00
Receipts:				
Interest on investments	4,716.50		302.26	
Cash transfer (Bache)		1,000.00		
Total	6,157.50	175,745.50	1,981.76	10,000.00
Disbursements:				
Distribution of consolidated	4,847.25			
Grants and medals			408.60	
Balance June 30, 1921:				
Cash	1,310.25	1,517.75	655.66	
Invested		174,227.75	917.50	10,000.00
Total	6,157.50	175,745.50	1,981.76	10,000.00

	Elliot fund.		Gibbs fund.	
	Income.	Capital.	Income.	Capital.
Balance Jan. 1, 1921:				
Cash	$847.89		$72.15	
Invested	300.00	$8,000.00	500.00	$5,545.50
Receipts, interest on investments	228.85		164.74	
Total	1,376.74	8,000.00	736.89	5,545.50
Disbursements:				
Honorarium and gold medal	401.78			
Grant			200.00	
Balance June 30, 1921:				
Cash	674.96		36.89	
Invested	300.00	8,000.00	500.00	5,545.50
Total	1,376.74	8,000.00	736.89	5,545.50

Accounts with individual funds Jan. 1 to June 30, 1921—Continued.

	Gould fund.		Hale lectureship.	
	Income.	Capital.	Income.	Capital.
Balance Jan. 1, 1921:				
Cash	$837.16	$7.50	$40.59	.....
Invested	7,010.00	19,992.50	200.00	.....
Receipts:				
Interest on investments	710.56	.....	4.24	.....
Total	8,557.72	20,000.00	244.83	.....
Disbursements:				
Grants	650.00	.....	.....	.....
Balance June 30, 1921:				
Cash	897.72	2,007.50	44.83	.....
Invested	7,010.00	17,992.50	200.00	.....
Total	8,557.72	20,000.00	244.83	.....

	Hartley fund.		Marsh fund.	
	Income.	Capital.	Income.	Capital.
Balance Jan. 1, 1921:				
Cash	$166.94	.....	$1,457.38	.....
Invested	.....	$1,200.00	150.00	$20,000.00
Receipts, interest on investments	33.44	.....	557.71	.....
Total	200.38	1,200.00	2,165.09	20,000.00
Disbursements:				
Medal	69.70	.....	.....	.....
Grants	.....	.....	800.00	.....
Balance June 30, 1921:				
Cash	130.68	.....	1,215.09	.....
Invested	.....	1,200.00	150.00	20,000.00
Total	200.38	1,200.00	2,165.09	20,000.00

	Murray fund.		Emergency fund, Proceedings.	
	Income.	Capital.	Income.	Capital.
Balance Jan. 1, 1921:				
Cash	$611.76	.....	$477.54	.....
Invested	400.00	$6,000.00	.....	.....
Receipts:				
Interest on investments	174.74	.....	.....	.....
Loan repaid by Academy Proceedings	.....	.....	1,562.46	.....
Total	1,186.50	6,000.00	2,040.00	.....
Disbursements:				
Medal	9.27	.....	.....	.....
Balance June 30, 1921:				
Cash	777.23	.....	2,040.00	.....
Invested	400.00	6,000.00	.....	.....
Total	1,186.50	6,000.00	2,040.00	.....

Accounts with individual funds Jan. 1 to June 30, 1921—Continued.

	Academy Proceedings.		Joint Proceedings.	
	Income.	Capital.	Income.	Capital.
Balance Jan. 1, 1921;				
Cash				
Receipts:				
Subscriptions	$167.00		$453.39	
Annual dues	1,035.00			
Reprints and separates	465.57			
Transfer from Billings fund	139.70			
Special contributions secured by Dr. Chas. D. Walcott	3,171.00			
Payment by National Research Council for space	832.48			
Contribution by National Research Council			1,250.00	
Transferred from Academy Proceedings to Joint Proceedings representing contribution by National Academy of Sciences			1,250.00	
Total	5,810.75		2,953.39	
Disbursements:				
Salary of managing editor			375.00	
Printing and distributing	1,763.24		366.11	
Expenses Boston office	70.00		105.00	
Expenses Washington office	39.29		129.86	
Loan repaid to emergency fund, Proceedings	1,562.46			
Transferred from Academy Proceedings to Joint Proceedings representing contributions by National Academy of Sciences	1,250.00			
Balance June 30, 1921, cash	1,125.76		1,977.42	
Total	5,810.75		2,953.39	

	Smith fund.		Thompson fund.	
	Income.	Capital.	Income.	Capital.
Balance Jan. 1, 1921:				
Cash	$1,413.76		$173.93	
Invested	2,560.00	$10,000.00		$10,000.00
Receipts:				
Interest on investments	357.23		212.50	
Additional contribution by Mrs. Mary Clark Thompson			400.00	
Total	4,330.99	10,000.00	786.43	10,000.00
Disbursements:				
Grant	500.00			
Proof medal by artist			350.00	
Gold medal			415.57	
Balance June 30, 1921:				
Cash	1,288.49		20.86	
Invested	2,542.50	10,000.00		10,000.00
Total	4,330.99	10,000.00	786.43	10,000.00

Accounts with individual funds Jan. 1 to June 30, 1921—Continued.

	Watson fund.	
	Income.	Capital.
Balance Jan. 1, 1921:		
Cash	$918.85	$23.75
Invested	1,780.00	24,976.25
Receipts:		
Interest on investments	685.86	.....
Total	3,384.71	25,000.00
Disbursements:		
Grants	500.00	.....
Balance June 30, 1921:		
Cash	1,104.71	23.75
Invested	1,780.00	24,976.25
Total	3,384.71	25,000.00

NATIONAL RESEARCH COUNCIL.

During the six months beginning January 1, 1921, the activities of the National Research Council were supported by funds derived from various sources. The following list gives the main sources of these funds:

(1) For general maintenance expenses of the National Research Council the sum of $85,000 was received from the Carnegie Corporation of New York.

(2) From the Rockefeller Foundation the following amounts were received and disbursed: For the division of medical sciences the sum of $4.98 was received and the sum of $504.98 was disbursed. For the division of physical sciences the sum of $8,320.83 was received and the sum of $4,367.35 was disbursed. For national research fellowships the sum of $27,114.72 was received and the sum of $22,109.40 was disbursed.

(3) From the General Education Board contribution was made as follows: For the mental rating of school children, nothing was received, but $98.38 was disbursed, thus closing the account. For special work carried on by the division of educational relations, the sum of $2,500 was received and the sum of $4,945.67 was disbursed.

(4) Other contributions included:

The sum of $1,583.33 from the Southern Pine Association (part payment on pledge of $10,000) for the committee on forestry.

The sum of $500 from Julius Rosenwald toward the support of a fellowship.

From various sources: For food and nutrition committee, $1,200; for the trustees for the publication of physical and chemical con-

stants, $3,120; for international auxiliary language, $1,025; for national intelligence tests, $500; for expenses of exhibits, Chemical Warfare Service, $9,056.56.

Receipts and disbursements of the National Research Council, January 1, 1921, to June 30, 1921.

RECEIPTS.

Jan. 1, 1921. Cash in bank	$28,305.26	
Investments owned:		
Unappropriated fund, special	3,100.00	
		$31,405.26
Appropriations:		
Rockefeller Foundation—		
Medical sciences (R. F. 2369)	4.98	
Physical sciences (R. F. 2518)	8,320.83	
National Research fellowships (R. F. 2517)	27,114.72	
General Education Board—		
Division of educational relations	2,500.00	
Food and nutrition committee	1,200.00	
Trustees for the publication of physical and chemical constants	3,120.00	
Sale of United States Treasury 5¾ per cent certificates	3,500.00	
Interest on United States Treasury 5¾ per cent certificates	101.18	
Carnegie Corporation of New York (direct)	85,000.00	
Miscellaneous receipts	26,245.83	
Reimbursements	1,166.23	
Committee on forestry	1,583.33	
International auxiliary language	1,025.00	
Rosenwald fellowship	500.00	
Unappropriated fund, special (interest on investments)	79.24	
Sale of United States Treasury certificates	50,208.74	
Interest received on United States Treasury certificates	1,686.56	
Expenses of exhibit, chemical warfare service	9,056.56	
National intelligence tests	500.00	
		222,913.20
		254,318.46

DISBURSEMENTS.

Divisions:	
I. Federal relations, general maintenance, 1921	30.50
II. Foreign relations—	
General maintenance, 1921	222.71
William Ellery Hale fund, 1921	675.83

Divisions—Continued.	
III. States relations—	
General maintenance—	
1920	$174.94
1921	326.49
IV. Educational relations—	
General maintenance, 1921	253.63
General education board	4,945.67
V. Research extension—	
General maintenance, 1921	1,182.41
Expenses of exhibit, chemical warfare service, 1921	8,837.78
VI. Research information service—	
General maintenance—	
1920	130.06
1921	1,049.79
Contingent expenses, 1921	387.03
Equipment, 1921	668.43
National Academy Proceedings and subscriptions, 1921	2,082.48
General education board, mental rating of school children	98.38
Personnel research federation	311.52
VII. Division of physical sciences—	
General maintenance, 1921	1,040.35
Traveling expenses, etc. (R. F. 2518)	4,367.35
Transactions of the American Mathematical Society, 1921	600.00
VIII. Engineering—	
General maintenance, 1921	1,128.16
Office expenses, 1921	390.27
Projects, 1921	486.83
Industrial personnel conference, 1921	213.52
IX. Chemistry and chemical technology—	
General maintenance, 1921	814.15
International auxiliary language	1,109.00
Research fellowships (R. F. 2517)	22,109.40
Trustees for the publication of physical and chemical constants	945.50
Purchase of United States Treasury certificates	6,500.00
Projects, 1921	250.00
X. Geology and geography—	
General maintenance, 1921	1,061.64
Bulletin of the Seismological Society	300.00
Projects, 1921	-------
XI. Medical sciences—	
General maintenance, 1921	1,671.47
Rockefeller Foundation (R. F. 2369)	504.98
Projects, 1921	532.12

Divisions—Continued.		
XII. Biology and agriculture—		
General maintenance, 1921	$1,203.15	
Botanical abstracts, 1921	677.96	
Committee on forestry	765.05	
Food and nutrition committee	525.73	
Food products investigation fund	250.00	
Physiological salt requirements committee, 1921	178.81	
Rosenwald fellowship	1,166.66	
European distribution of American biological journals, 1921	1,000.00	
Promotion of Sigma Xi research fellowships	200.00	
XIII. Anthropology and psychology—		
General maintenance, 1921	1,788.65	
American archæological project, 1921	82.27	
National intelligence tests, 1921	300.00	
Function of the semicircular canals, 1921	614.30	
Executive board, general maintenance—		
1920	----------	
1921	1,955.32	
American Geophysical Union, 1921	574.37	
Publicity committee, general maintenance. 1921	1,039.41	
Publications, 1921	2,977.68	
Committee on Concilium Bibliographicum, 1921	600.00	
Committee on conservation, 1921	143.99	
Contingent expenses, 1921	406.00	
Electricity, 1921	410.30	
Expenses and supplies. 1921	2,340.84	
Fuel, 1921	52.81	
New equipment, general, 1921	584.45	
Rent—		
1921	3,125.00	
1922	625.00	
Salaries, 1921	60,365.40	
Telephone and telegraph, 1921	755.86	
Purchase of United States Treasury 5¾ per cent certificates	25,208.74	
Purchase of United States Treasury 5½ per cent certificates	70,000.00	
		$245,320.14
June 30, 1921:		
Cash in bank	5,898.32	
Investments owned:		
Unappropriated fund, special	3,100.00	
		8,998.32
		254,318.46

F. L. RANSOME, *Treasurer.*

AUGUST 1, 1921.

REPORT OF THE AUDITING COMMITTEE.

WASHINGTON, *D. C., July 30, 1921.*

We have employed the Capital Audit Co. to scrutinize and report on the treasurer's books. We accepted the certificate, dated July 6, 1921, of the American Security & Trust Co. regarding notes owned by the academy and deposited for collection; we have examined the securities owned by the academy and papers contained in the box of the National Academy of Sciences at the vault of the American Security & Trust Co. We find them to correspond to the list checked by the auditing committee on January 15, 1921, except as modified by transactions between January 1, 1921, and June 30, 1921, reported by the Capital Audit Co. We find that the coupons falling due during this period have been cut and accounted for, and those due July 1, 1921, have been deposited and are accounted for by appropriate entries in the pass book. We find that interest on loans has been accounted for. Correspondence between vouchers, pass books, and accounts of the treasurer is certified by the Capital Audit Co. We find the net balance reported by the treasurer as of June 30, 1921, to accord with the statement of the American Security & Trust Co. and with the check book. This entire paragraph relates to the accounts of the National Academy of Sciences proper.

There is also a statement of the accounts of the National Research Council, whose funds are deposited in two separate accounts to the credit of the academy. These accounts have been included in the report of the Capital Audit Co. We have examined the long-term securities of the National Research Council deposited in the box of the American Security & Trust Co. and find them correct. We accepted the certificate, dated July 7, 1921, of the Riggs National Bank as to United States Treasury certificates of indebtedness owned by the National Research Council and held by the bank for collection. We find that the net balance reported by the treasurer as of June 30, 1921, agrees with the statements of the American Security & Trust Co. and of the Riggs National Bank for these accounts. Correspondence between vouchers, pass books, and accounts of the treasurer for the National Research Council is certified by the Capital Audit Co.

ARTHUR L. DAY,
L. O. HOWARD,
Auditing Committee.

DECEASED MEMBERS.

HENRY ANDREWS BUMSTEAD.

[The Scientific Monthly, Vol. XII, No. 4, April, 1921, pp. 379–381, ill.]

Prof. Bumstead, of Yale University, whose admirable address on the history of physics is printed in the present issue of the Monthly, died suddenly on the night of December 31, at the age of 50 years. He had been in attendance on the meetings of the Physical Society at Chicago, of which he was a past president, and active in numerous conferences and committee meetings held during convocation week. The writer of this note was in conference with him concerning the organization of the Science Service, endowed by Mr. Scripps, until midnight on Thursday and again through Friday afternoon. His clear judgment and wise council were in constant evidence, and he appeared to be in the best of health. On Friday evening he took the train for Washington; on the following morning he was found dead in his berth.

Bumstead was the chairman of the National Research Council for the present year, succeeding Dr. James Rowland Angell, who now assumes the presidency of Yale University, where Bumstead was professor of physics and director of the Sloane Physical Laboratory. He remarked at Chicago that he was ready to devote this year to the odd jobs of science, but that he planned at the end of it to return to the research work interrupted by the war. This work was concerned with radioactivity and the Röntgen rays. He was especially interested in photoelectric effects, delta rays, and the theory of electrons.

In Nature for February 5 will be found an appreciation by Sir J. J. Thomson, with whom Bumstead worked at Cambridge and with whom, as president of the Royal Society, he was associated during the war period. Prof. R. A. Millikan, with whom Bumstead had been closely associated both as a physicist and in the conduct of the National Research Council, writes in an article printed in the issue of Science for January 25:

> When in 1917 the important and difficult post of scientific attaché in London was created, Bumstead was the only man considered, for no scientist in this country had his tact, his judgment, his knowledge of England, and his ability to assist in bringing about what was then, and what is now, the most important need of the modern world, namely, the cooperation and mutual understanding of the two great branches of the Anglo-Saxon race. Bumstead's

success in London was extraordinary. The British liked and trusted him. Admiral Sims and our own War Department placed large responsibilities upon him, and his office became the center of a very active and very important service. Young American officers who went abroad on scientific missions found him the center of their contacts and the prime source of their usefulness. They all became his devoted admirers. Not one or two, but a dozen or more, of both British and American officers who came to Washington during the war, told me that they owed their success in their work in England and the Continent primarily to Bumstead, and counted it the most valuable part of their experience that they had had an opportunity to become acquainted with him. One of these officers described him as the most influential American in England.

He had a brilliant analytical mind, profound scholarship, exceptional critical capacity, excellent judgment, an extraordinary winsome personality, the finest culture, and a great heart. His personal scientific contributions were important, though they had been much interfered with by his none too rugged health. His effect upon American physics, however, was not limited to his own scientific papers, but he exerted a powerful influence upon his pupils and upon his fellow physicists. It is not merely American science, however, which can ill afford to lose him 20 years before his time. American life in all its aspects is sadly in need of men of Bumstead's type. The cause of sanity, of culture, of Anglo-Saxon solidarity, of scholarship, of science, of world civilization, all suffer irreparably through his death.

EDWARD BENNETT ROSA.

[Science, new series, Vol. LIII, No. 1382, June 24, 1921, p. 569.]

By S. W. Stratton.

Dr. Edward B. Rosa, chief physicist of the Bureau of Standards at Washington, died suddenly at his desk on Tuesday afternoon, May 17, 1921. Dr. Rosa was at the time the chief of Division I of the Bureau of Standards, the functions of which include research, standardization, and testing in the fields of electricity, magnetism, photometry, radio communication, radium, X-ray, and public utilities. Dr. Rosa was appointed physicist in the bureau in 1901. In 1910 he was given the grade of chief physicist. Dr. Rosa's painstaking accuracy in scientific research is well known among specialists in the fields in which he worked. His investigations have been published in 36 scientific publications of the bureau and 4 technologic papers, not to speak of a large number of special reports, circulars, and articles in technical journals.

Among the researches of unusual interest may be mentioned the precise determination of the value of the coulomb, the value of the ampere, and of the ratio between the electrostatic and the electromagnetic units of electricity. His other laboratory researches include a wide range of problems chiefly connected with the improvement of the standards and methods used in precise electrical measurements.

Perhaps one of the most striking examples of Dr. Rosa's thoroughness and success in securing the cooperation of the technical groups interested may be found in the development and publication of the national electrical safety code, the revised form of which has just recently appeared as a "handbook" issued by the Bureau of Standards.

In his work as administrator he successfully organized the work of electrical testing, photometry, radium testing, and research and standardization work involved in radio communication. Dr. Rosa showed a deep interest in all phases of the bureau's development, and will be remembered with profound respect and admiration by his colleagues. His work will endure as a permanent foundation for the branches of physics and electrical engineering to which he devoted so many useful years of his life.

DEPARTMENT OF COMMERCE,
BUREAU OF STANDARDS.

[Nature, London, No. 2693, vol. 107, June 9, 1921, pp. 465–466.]

The death, on May 17, of Prof. Edward Bennett Rosa, of the Bureau of Standards, at Washington, at the age of 60 years, is a serious blow to electrical science. Born in 1861, Prof. Rosa gained distinction as a student in the Johns Hopkins University under Rowland, and after some experience in professional work in the Wesleyan University, where his early undergraduate days had been passed, was in 1901 appointed to the staff of the Bureau of Standards as a physicist. There his main work was done. In 1910 he became chief physicist, and as head of the electrical department was responsible for many of the valuable researches which have been carried out at the bureau.

Among the earliest of these was his determination, in collaboration with Dr. Dorsey, of "v," the ratio of the electric units, and most of them turn on questions relating to the measurement of the fundamental units, the ohm, the ampere, and the volt. He combined in a marked degree the insight required to design and carry through to a successful result a difficult experiment and the mathematical skill needed to develop to a high degree of accuracy the theory on which the experiment is based.

Prof. Rosa's papers on the calculation of coefficients of self and mutual induction, and on the theory of the instruments employed in absolute measurements, will always be standard, while his own experimental determination of some of the fundamental quantities are among the best which have been made. He realized the need for accuracy and exactness in the processes of measurement, whether applied to scientific work or to industry, and he organized the electrical section of the bureau in a manner which fitted it to respond to the requirements both of scientific and industrial research. The list of his papers covers a wide range, and in all of them he added to our knowledge in a substantial manner.

Prof. Rosa visited England in 1908, acting, along with Dr. Stratton and Prof. Carhart, as one of the American representatives to the International Electrical Conference, held in London under the presidency of the late Lord Rayleigh. At that conference a formal distinction was drawn between the absolute and the international units of measurement, between the ohm (10° abso-

lute C. G. S. units) and the international ohm—the resistance at 0° C. of a uniform column of mercury weighing 14.521 grams, and 106.300 centimeters in length, or the ampere (10^{-1} absolute C. G. S. units) and the international ampere—the current which under certain carefully defined conditions deposits from a solution of nitrate of silver a mass of 1.11800 milligrams of silver per second.

Prof. Rosa would probably have preferred to retain as standards for legal purposes the absolute magnitudes 10^9 C. G. S. units for resistance and 10^{-1} C. G. S. units for current, but he accepted the views of the majority of the conference, and at a later date lent his valuable assistance in defining accurately the conditions necessary for the realization of the international ohm, ampere, and volt. As the outcome of the work of the conference, a committee, known as Lord Rayleigh's committee, was appointed to define these conditions, and representatives of England, France, and Germany met at Washington and carried out a series of experiments, the results of which have determined the practice of all national standardizing laboratories. Of the committee engaged in this work, Prof. Rosa was the active head, and its successful issue was due in no small degree to his skill in overcoming the technical difficulties of the task and to his tact in dealing with the varied views of those engaged in the research.

The volume giving an account of these experiments, published by the Bureau of Standards in 1912, will form a fitting memorial of one who for the last 20 years devoted himself unweariedly to the advancement of electrical science. During the war he directed the development of a number of instruments of great use to the American forces in France. Among these may be mentioned a sound-ranging device and much radio apparatus suitable especially for aircraft. He was greatly instrumental in establishing the splendid radio laboratory at the bureau. Throughout his life he was keenly interested in the prevention of industrial accidents and in the provision of safety standards for the guidance of public authorities. The National Electrical Safety Code at present in use in the United States owes much to him. His last work, now in the press, was an analysis of the expenditure of the Government departments, which contains a number of statistics of great importance and interest.

Prof. Rosa was married in 1894, and Mrs. Rosa survives him. She has the deep sympathy of all those on this side of the Atlantic who knew her husband and appreciated his work.

APPENDIXES.

APPENDIX A.

CONSTITUTION OF THE NATIONAL ACADEMY.

[As amended and adopted Apr. 17, 1872, and further amended Apr. 20, 1875; Apr. 21, 1881; Apr. 19, 1882; Apr. 18, 1883; Apr. 19, 1888; Apr. 18, 1895; Apr. 20, 1899; Apr. 17, 1902; Apr. 18, 1906; Nov. 20, 1906; Apr. 17, 1907; Nov. 20, 1907; Apr. 20, 1911; Apr. 16, 1912; Apr. 21, 1915.]

PREAMBLE.

Empowered by the act of incorporation enacted by Congress, and approved by the President of the United States on the 3d day of March, A. D. 1863, and in conformity with amendments to said act approved July 14, 1870, June 20, 1884, and May 27, 1914, the National Academy of Sciences adopts the following amended constitution and rules:

ARTICLE I.—OF MEMBERS.

SECTION 1. The Academy shall consist of members, honorary members, and foreign associates. Members must be citizens of the United States.

SEC. 2. Members who, from age or inability to attend the meetings of the Academy, wish to resign the duties of active membership, may, at their own request, be transferred to the roll of honorary members by a vote of the Academy.

SEC. 3. The Academy may elect 50 foreign associates.

SEC. 4. Honorary members and foreign associates shall have the privilege of attending the meetings and of reading and communicating papers to the Academy, but shall take no part in its business, shall not be subject to its assessments, and shall be entitled to a copy of the publications of the Academy.

ARTICLE II.—OF THE OFFICERS.

SECTION 1. The officers of the Academy shall be a president, a vice president, a foreign secretary, a home secretary, and a treasurer, all of whom shall be elected for a term of four years, by a majority of votes present, at the first stated meeting after the expiration of the current terms, provided that existing officers retain their places until their successors are elected. In case of a vacancy, the election for four years shall be held in the same manner at the meeting when such vacancy occurs, or at the next stated meeting thereafter, as the Academy may direct. A vacancy in the office of treasurer or home secretary may, however, be filled by appointment of the president of the Academy until the next stated meeting of the Academy.

SEC. 2. The officers of the Academy, together with six members to be elected by the Academy, shall constitute a council for the transaction of such business as may be assigned to them by the constitution or the Academy.

SEC. 3. The president of the Academy, or, in case of his absence or inability to act, the vice president, shall preside at the meetings of the Academy and of the council; shall name all committees except such as are otherwise especially provided for; shall refer investigations required by the Government of the United States to members especially conversant with the subjects and report thereon to the Academy at its meeting next ensuing; and, with the council, shall direct the general business of the Academy.

It shall be competent for the president, in special cases, to call in the aid, upon committees, of experts or men of special attainments not members of the Academy.

The president shall be, ex officio, a member of all committees empowered to consider questions referred to the Academy by the Government of the United States.

SEC. 4. The foreign and home secretaries shall conduct the correspondence proper to their respective departments, advising with the president and council in cases of doubt, and reporting their action to the Academy at one of the stated meetings in each year.

It shall be the duty of the home secretary to give notice to the members of the place and time of all meetings, of all nominations for membership, and of all proposed amendments to the constitution.

It shall be the duty of the home secretary to keep the minutes of each business and scientific session, and after approval to enter these upon the permanent records of the Academy.

SEC. 5. The treasurer shall attend to all receipts and disbursements of the Academy, giving such bond and furnishing such vouchers as the council may require. He shall collect all dues, assessments, and subscriptions, and keep a set of books showing a full account of receipts and disbursements and the condition of all funds of the Academy. He shall be the custodian of the corporate seal of the Academy.

ARTICLE III.—OF THE MEETINGS.

SECTION 1. The Academy shall hold one stated meeting, called the annual meeting, in April of each year in the city of Washington, and another stated meeting, called the autumn meeting, at a place to be determined by the council. The council shall also have power to fix the date of each meeting.

Special business meetings of the Academy may be called, by order of eight members of the council, at such place and time as may be designated in the call.

Special scientific meetings of the Academy may be held at times and places to be designated by a majority of the council.

SEC. 2. The names of the members present at each session of a meeting shall be recorded in the minutes, and 20 members shall constitute a quorum for the transaction of business.

SEC. 3. Scientific sessions of the Academy, unless otherwise ordered by a majority of the members present, shall be open to the public; sessions for the transaction of business shall be closed.

SEC. 4. Stated meetings of the council shall be held during the stated or special meetings of the Academy, and four members shall constitute a quorum for the transaction of business. Special meetings of the council may be convened at the call of the president and two members of the council, or of four members of the council.

SEC. 5. No member whose dues are in arrears shall vote at any business meeting of the Academy.

ARTICLE IV.—OF ELECTIONS AND REGULATIONS.

SECTION 1. All elections of officers and members shall be by ballot, and each election shall be held separately.

SEC. 2. The time for holding an election of officers shall be fixed by the Academy at least one day before the election is held.

SEC. 3. The election of the six members of the council shall be as follows:

At the annual meeting in April, 1907, six members of the council to be elected, of whom two shall serve for three years, two for two years, and two for one year, their respective terms to be determined by lot. Each year thereafter the terms of two members shall expire, and their successors, to serve for three years, shall be elected at the annual meeting in each year.

SEC. 4. The Academy shall be divided by the council into sections representing the principal branches of scientific research. Each section shall elect its own chairman, who shall serve for three years. The chairman shall be responsible to the Academy for the work of his section.

Nominations to membership in the Academy shall be made in writing and approved by a majority of the members of the section on the branch of research in which the person nominated is eminent, or by a majority of the council in case there is no section on the subject. The nomination shall be sent to the home secretary by the chairman of the section before January 1 of the year in which the election is to be held, and each nomination shall be accompanied by a list of the principal contributions of the nominee to science. This list shall be printed by the home secretary for distribution among the members of the Academy.

SEC. 5. Election of members shall be held at the annual meeting in Washington in the following manner: There shall be two ballots—a preference ballot, which may be prepared either before or at the annual meeting, and must be transmitted to the home secretary, and a final ballot, to be taken at the meeting.

Preference ballot.—Each member may inscribe on a ballot not more that 15 names of nominees selected from the submitted list. A list of the nominees shall then be prepared, on which the names shall be entered in the order of the number of votes received by each. In case two or more nominees have the same number of votes on this preference list, the order in which they shall be placed on the list shall be determined by a majority vote of members present.

Final ballot.—A vote shall first be taken on the nominee who appears first on the preference list, and he shall be declared elected if he receive two-thirds of the votes cast and not less than 25 votes in all. A vote shall then be taken in similar manner on the nominee standing second on the preference list, and so on until all the nominees on the preference list shall have been acted on, or until 15 nominees shall have been elected, or until the total membership of the Academy shall have reached 250.

Not more than 15 members shall be elected at one annual meeting.

Before and during elections a discussion of the merits of nominees will be in order.

SEC. 6. Every member-elect shall accept his membership, personally or in writing, before the close of the next stated meeting after the date of his election. Otherwise, on proof that the secretary has formally notified him of his election, his name shall not be entered on the roll of members.

SEC. 7. Foreign associates may be nominated by the council and may be elected at the annual meeting by a two-thirds vote of the members present.

SEC. 8. A diploma, with the corporate seal of the Academy and the signatures of the officers, shall be sent by the appropriate secretary to each member on his acceptance of membership, and to foreign associates on their election.

SEC. 9. Resignations shall be addressed to the president and acted on by the Academy.

SEC. 10. Whenever a member has not paid his dues for four successive years, the treasurer shall report the fact to the council, which may report the case to the Academy with the recommendation that the person thus in arrears be declared to have forefeited his membership. If this recommendation be approved by two-thirds of the members present, the said person shall no longer be a member of the Academy and his name shall be dropped from the roll.

ARTICLE V.—SCIENTIFIC COMMUNICATIONS, PUBLICATIONS, AND REPORTS.

SECTION 1. Communications on scientific subjects shall be read at scientific sessions of the Academy, and papers by any member may be read by the author or by any other member, notice of the same having been previously given to the secretary.

SEC. 2. Any member of the Academy may read a paper from a person who is not a member, and shall not be considered responsible for the facts or opinions expressed by the author, but shall be held responsible for the propriety of the paper.

Persons who are not members may read papers on invitation of the council or of the committee of arrangements.

SEC. 3. The Academy may provide for the publication, under the direction of the council, of proceedings, scientific memoirs, biographical memoirs, and reports.

The proceedings shall include the transactions of the Academy, brief original announcements of the results of scientific investigations made by members of the Academy or others, together with short original articles giving a comprehensive survey of the more important scientific researches currently made by American investigators, and other matters of general scientific interest.

The scientific memoirs shall provide opportunity for the publication of longer and more detailed scientific investigations.

The biographical memoirs shall contain an appropriate record of the life and work of deceased members of the Academy.

An annual report shall be presented to Congress by the president and shall contain the annual reports of the treasurer and the auditing committee, a suitable summary of the reports of the committees in charge of trust funds, and a record of the activities of the Academy for the calendar year immediately preceding, and other appropriate matter. This report shall be presented to Congress by the president after authorization by the council. It shall also be presented to the Academy at the annual meeting next following.

The treasurer shall prepare a full report of the financial affairs of the Academy at the end of the fiscal year. This report shall be submitted to the council for approval and afterwards presented to the Academy at the next stated meeting. He shall also prepare a supplementary financial statement to December 31 of the ensuing fiscal year for presentation at the annual meeting.

SEC. 4. Propositions for investigations or reports by the Academy shall be submitted to the council for approval, except those requested by the Government of the United States, which shall be acted on by the president, who will in such cases report their results to the Gov-

ernment as soon as obtained and to the Academy at its next following stated meeting.

SEC. 5. The advice of the Academy shall be at all times at the disposition of the Government upon any matter of science or art within its scope.

ARTICLE VI.—OF THE PROPERTY OF THE ACADEMY.

SECTION 1. All investments and reinvestments of either principal or accumulations of income of the trust and other funds of the Academy shall be made by the treasurer, with the approval of the finance committee, in the corporate name of the Academy, in the manner and in the securities designated or specified in the instruments creating the several funds, or, in the absence of such designation or specification, in bonds of the United States or of the several States, or in bonds or notes secured by first mortgages on real estate, in investments legal for savings banks under the laws of Massachusetts or New York, or in other bonds recommended to the treasurer by the fiscal advisers of the Academy.

The treasurer may invest the captial of all trust funds of the Academy which are not required by the instruments creating such funds to be kept separate and distinct, in a consolidated fund, and shall apportion the income received from such consolidated fund among the various funds composing the same in the proportion that each of said funds shall bear to the total amount of funds so invested; provided, however, that the treasurer shall at all times keep accurate accounts showing the amount of each trust fund, the proportion of the income from the consolidated fund to which it is entitled, and the expenses and disbursements properly chargeable to such fund.

SEC. 2. The council shall at its annual meeting in each year designate one bank or trust company in Washington, D. C., and one in New York City to act, when requested by the treasurer, as the fiscal advisers of the Academy.

SEC. 3. The treasurer shall have authority, with the approval of the finance committee, to sell, transfer, convey, and deliver in the corporate name and for the benefit of the Academy any stocks, bonds, or other securities standing in the corporate name.

SEC. 4. No contract shall be binding upon the Academy which has not been first approved by the council.

SEC. 5. The assessments required for the support of the Academy shall be fixed by the Academy on the recommendation of the council and shall be payable within the calendar year for which they are assessed.

ARTICLE VII.—OF TRUST FUNDS AND THEIR ADMINISTRATION.

SECTION 1. Devises, bequests, donations, or gifts having for their object the promotion of science or the welfare of the Academy may be accepted by the council for the Academy. Before the acceptance of any such trust the council shall consider the object of the trust and all conditions or specifications attaching thereto. The council shall make a report of its action to the Academy.

SEC. 2. Medals and prizes may be established in accordance with the provisions of trusts or by action of the Academy.

SEC. 3. Unless otherwise provided by the deed of gift, the income of each trust fund shall be applied to the objects of that trust by the action of the Academy on the recommendation of a standing committee on that fund.

ARTICLE VIII.—OF ADDITIONS AND AMENDMENTS.

Additions and amendments to the constitution shall be made only at a stated meeting of the Academy. Notice of a proposition for such a change must be submitted to the council, which may amend the proposition, and shall repart thereon to the Academy. Its report shall be considered by the Academy in committee of the whole for amendment.

The proposition as amended, if adopted in committee of the whole, shall be voted on at the next stated meeting, and if it receives two-thirds of the votes cast it shall be declared adopted.

Absent members may send their votes on pending changes in the constitution to the home secretary in writing, and such votes shall be counted as if the members were present.

APPENDIX B.

RULES.

[In accordance with a resolution of the Academy, taken at its meeting on Apr. 21, 1915, the rules are arranged in groups and each group is numbered to correspond with the article of the constitution to which it relates.]

I.

1. The holders of the medal for eminence in the application of science to the public welfare shall be notified, like members, of the meetings of the Academy, and invited to participate in its scientific sessions.

II.

1. The proper secretary shall acknowledge all donations made to the Academy, and shall at once report them to the council for its consideration.

2. The home secretary shall be the custodian of all books, apparatus, archives, and collections not explicitly assigned to other care.

3. The home secretary shall keep a record of all grants of money or awards of prizes or medals made from trust funds of the Academy. The assistant secretary, who may be a nonmember of the Academy, shall receive a salary to be fixed by the council. The record for each grant of money shall include the following items: Name of fund, date and number of the grant, name and address of recipient, amount of grant and date or dates of payment, purpose of grant, record of report of progress, and resulting publications.

4. The treasurer shall keep the home secretary informed of all warrants received from directors of trust funds not controlled by the Academy and of the date or dates of payment of all warrants.

5. The treasurer is authorized to defray, when approved by the president, all the proper expenses of committees appointed to make scientific investigations at the request of departments of the Government, and in each case to look to the department requesting the investigation for reimbursement to the Academy.

6. The treasurer is authorized to act as the treasurer ex officio of the National Research Council.

7. The treasurer shall have the assistance of a salaried and bonded officer, the bursar, who shall be chosen by the finance committee and be directly responsible to the treasurer.

III.

1. The annual meeting of the Academy shall begin on the fourth Monday of April. At the business sessions of the Academy the order of procedure shall be as follows:

(1) Chair taken by the president, or, in his absence, by the vice president.
(2) Roll of members called by home secretary (first session of the meeting only).
(3) Minutes of the preceding session read and approved.
(4) Stated business.
(5) Reports of president, secretaries, treasurer, and committees.
(6) Business from council.
(7) Other business.

2. The rules of order of the Academy shall be those of the Senate of the United States, unless otherwise provided by the constitution or rules of the Academy.

3. In the absence of any officer a member shall be chosen to perform his duties temporarily, by a plurality of viva voce votes, upon open nomination.

4. At each meeting the president shall announce the death of any members since the preceding meeting. As soon as practicable thereafter he shall designate a member to write—or to secure from some other source approved by the president—a biographical notice of each deceased member.

5. A local committee of five members, appointed for each meeting, and the home secretary shall together constitute the committee of arrangements, of which the home secretary shall be chairman.

It shall be the duty of the committee of arrangements to prepare the scientific program for the annual meeting, and for this purpose it shall be empowered to solicit papers from members or others. It shall also be empowered to ascertain the length of time required for reading papers to be presented at the scientific sessions of the Academy, and, when it appears advisable, to limit the time to be occupied in their presentation or discussion.

The committee of arrangements shall meet not less than two months previous to each meeting. It shall prepare the detailed program of each day, and in general shall have charge of all business and scientific arrangements for the meeting for which it is appointed.

6. No paper requiring more than 15 minutes for its presentation shall be accepted unless by invitation of the committee of arrangements.

No speaker shall occupy more than 30 minutes for presentation of papers during the scientific sessions of a single meeting of the Academy, except by invitation of the committee of arrangements.

Time shall not be extended except by vote of the Academy and then not to exceed five minutes. The presiding officer shall warn speakers two minutes before the expiration of their time.

The discussion of individual papers shall be limited not to exceed five minutes and the total time for discussion by any one speaker for all scientific sessions in any one meeting shall not exceed 15 minutes, unless approved by the Academy.

No paper shall be entered upon the printed program of scientific sessions unless the title is in the hands of the committee of arrangements at least two weeks in advance of the meeting. In the event that titles are received later, they shall be placed in order of receipt at the end of the list and read, if there is time. Such supplementary titles shall be conspicuously posted.

IV.

1. The term of service of each chairman of a section shall be three years, to date from the closing session of the April meeting next following his election. Chairmen of sections shall be chosen by mail ballot, the member receiving the highest number of votes cast to be deemed elected. It shall be the duty of each retiring chairman to conduct the election of his successor and to report the result of the election to the home secretary before the April meeting at which his term of service expires. Should any section fail to elect a chairman before November 1, the president is empowered to appoint a temporary chairman to serve until the April meeting next following. No chairman shall be eligible for reelection for two consecutive terms.

2. The chairman of each section of the Academy shall submit to the members of his section, not later than November 1 of each year, a ballot containing the names of all those persons who received not less than two votes in the nominating ballot of the preceding year and of any other persons who were newly proposed for consideration at that time. Each member of the section shall be expected to return this ballot to the chairman within two weeks with his signature and with crosses placed against the names of those persons whom he is prepared to indorse for nomination. Each member may also write upon the ballot in a place provided for the purpose any new names which he desires to have included in the ballot to be submitted to the section in the following year. The vote resulting from this ballot shall be regarded as informal.

The chairman shall then submit to the members of his section a new ballot showing the results of the informal vote; and each member shall be expected to return this ballot to the chairman with his signature and with crosses placed against the names of those persons

whom he will indorse for nomination. In order to secure an adequate number of nominations, the chairman, when necessary, shall obtain by personal solicitation a fuller vote of his section or shall submit to the section a supplementary formal ballot.

The chairman shall then certify to the home secretary, prior to January 1, the names of those persons who have been voted for on the formal ballots by a majority of the members of the section, and shall furnish him a list of the publications of these nominees, as required by the constitution.

3. Nominations for membership shall give the full name, residence, and the official positions successively held by the candidate, in addition to the list of his contributions to science required by the constitution.

4. Preference ballots for election of members shall be sealed in a blank envelope, which shall be inclosed in another bearing the name of the sender, and which shall be addressed to the home secretary. Such envelopes shall be opened only by the tellers. If in any case the tellers are unable to determine who cast a ballot, or if the latter contains more names than are to be voted for, the ballot shall be rejected, but minor defects in a ballot shall be disregarded when the intent of the voter is obvious.

5. All discussions of the claims and qualifications of nominees at meetings of the academy shall be held strictly confidential, and remarks and criticisms then made may be communicated to no person who was not a member of the Academy at the time of the discussion.

V.

1. The publication of the Proceedings shall be under the general charge of the council, which shall have final jurisdiction upon all questions of policy relating thereto.

The managing editor, who may be a nonmember of the Academy, shall receive a salary which shall be fixed by the council.

The National Academy of Sciences and the National Research Council shall cooperate in the publication of the Proceedings, beginning with Volume VII.

The management of the Proceedings shall be vested in an executive committee of three, consisting of the managing editor as chairman, for a term of one year, of a representative of the Academy, and a representative of the National Research Council, each to be appointed for a term of three years.

The editorial board shall consist of the home secretary and the foreign secretary of the Academy, the chairman and the permanent secretary of the National Research Council as ex officio members; and, in addition, of 10 representatives of the Academy and seven

representatives of the Research Council, these numbers corresponding to the number of sections of the Academy and the number of divisions of science and technology of the Research Council.

Beginning with Volume VII the operation of the Proceedings shall be placed upon a budget basis, the size of the volume in any year to be determined by the conditions of the budget, the equal amounts contributed by each organization being determined by mutual agreement before the beginning of each calendar year.

The managing editor of the Proceedings shall be appointed by the council of the Academy and the executive board of the National Research Council upon the nomination of the editorial board.

2. Memoirs may be presented at any time to the home secretary, who shall report the date of their reception at the next session; but no memoir shall be published unless it has been read or presented by title before the Academy.

Before publication all biographical and scientific memoirs must be referred to the committee on publication, who may, if they deem best, refer any memoir to a special committee, appointed by the president, to determine whether the same should be published by the Academy.

3. Memoirs shall date, in the records of the Academy, from the date of their presentation to the Academy, and the order of their presentation shall be so arranged by the secretary that, so far as may be convenient, those upon kindred topics shall follow one another.

4. The annual report of the treasurer shall contain:

(1) A concise statement of the source, object, and amount of all trust funds of the academy.
(2) A condensed statement of receipts and expenditures.
(3) A statement of assets and liabilities.
(4) Accounts with individual funds.
(5) Such other matter as he considers appropriate.

5. The accounts of the treasurer shall, between July 1 and August 1 of each year, be audited under the direction of a committee of three members to be appointed by the president at the annual meeting of the Academy. It shall be the duty of the auditing committee to verify the record of receipts and disbursements maintained by the treasurer and the agreement of book and bank balances; to examine all securities in the custody of the treasurer and to compare the stated income of such securities with the receipts of record; to examine all vouchers covering disbursements for account of the Academy, including the National Research Council, and the authority therefor, and to compare them with the treasurer's record of expenditures; to examine and verify the account of the Academy with each trust fund. The auditing committee may employ an expert accountant to assist the committee in the examination of the books of the treasurer. The

annual report of the treasurer shall be published with that of the president to Congress. The reports of the treasurer and auditing committee shall be presented to the Academy at the autumn meeting, and shall be published with that of the president to Congress. They shall be distributed to the members in printed form at the annual meeting.

VI.

1. All apparatus and other materials of permanent value purchased with money from any grant from a trust fund shall be the property of the Academy unless specific exception is made in the grant or by subsequent action of the council or the directors of the trust fund concerned. Receipts for all such property shall be signed by the grantee and shall be forwarded to the home secretary. All apparatus and unused material of value acquired in this way shall be delivered to the home secretary on completion of the investigation for which the grant was made, or at any time on demand of the council, and the home secretary shall give an appropriate release therefor.

2. The books, apparatus, archives, and other collections of the Academy shall be deposited in some safe place in the city of Washington. A list of the articles so deposited shall be kept by the home secretary, who is authorized to employ a clerk to take charge of them.

3. A stamp corresponding to the corporate seal of the Academy shall be kept by the secretaries, who shall be responsible for the due markings of all books and other objects to which it is applicable.

Labels or other proper marks of similar device shall be placed upon objects not admitting of the stamp.

4. The fiscal year of the Academy shall end on June 30 of each year.

5. The standing committee on finance shall consist of the president of the Academy ex officio, the treasurer ex officio as chairman, and five members to be appointed annually by the president, two of whom may be nonmembers of the Academy.

That a budget committee on the expenses of the National Academy and the National Research Council, to consist of the president of the Academy, the chairman of the National Research Council, and the treasurer of the National Academy of Sciences and the National Research Council, be appointed and the president of the Academy act as chairman.

VII.

1. Standing committees of the Academy on trust funds the income of which is applied to the promotion of research shall consist of three or five members. In order to secure rotation in office in such committees, when not in conflict with the provisions of the deeds of gift,

the term of service on a committee of three members shall be three years; on a committee of five members the term shall be five years.

2. The annual reports of the committees on research funds shall, so far as the Academy has authority to determine their form, give a current number to each award, stating the name, position, and address of the recipient; the subject of research for which the award is made, and the sum awarded; and in later annual reports the status of the work accomplished under each award previously made shall be announced, until the research is completed, when announcement of its completion and, if published, the title and place of publication shall be stated, and the record of the award shall be reported as closed.

VIII.

1. Any rule of the Academy may be amended, suspended, or repealed on the written motion of any two members, signed by them, and presented at a stated meeting of the Academy, provided the same shall be approved by a majority of the members present.

APPENDIX C.

ORGANIZATION OF THE ACADEMY, 1921.

	Expiration of term.
Walcott, Charles D., president	April, 1923
Michelson, A. A., vice president	April, 1923
Millikan, R. A., foreign secretary	April, 1922
Abbot, C. G., home secretary	April, 1923
Ransome, F. L., treasurer	April, 1923

ADDITIONAL MEMBERS OF COUNCIL.

1919–1922.

Carty, J. J.

Donaldson, H. H.

1920–1923.

Day, A. L.

Morgan, T. H.

1921–1924.

Pearl, Raymond.

Hale, George E.

SECTIONS.

1. MATHEMATICS.

Birkhoff, G. D.
Blichfeldt, H. F.
Bliss, G. A.
Bolza, Oskar
Dickson, L. E.
Kasner, Edward
Miller, George A.
Moore, E. H.
Osgood, W. F.
Story, W. E.
Van Vleck, E. B.
Veblen, Oswald
White, H. S. (chairman, 1922).
Wilczynski, E. J.

2. ASTRONOMY.

Abbot, C. G. (chairman, 1923).
Adams, W. S.
Aitken, R. G.
Barnard, E. E.
Campbell, W. W.
Comstock, G. C.
Curtis, H. D.
Elkin, W. L.
Frost, E. B.
Hale, G. E.
Leuschner, A. O.
Moulton, F. R.
Russell, H. N.
Schlesinger, Frank
Seares, F. H.
Slipher, V. M.
Stebbins, Joel

3. PHYSICS.

Ames, J. S.
Barus, Carl
Bell, A. G.
Bridgman, P. W.
Crew, Henry
Duane, William
Hall, E. H.
Hastings, C. S.
Hayford, J. F.
Lyman, Theodore
Mendenhall, C. E.
Mendenhall, C. E.
Merritt, Ernest
Michelson, A. A.
Miller, D. C.
Millikan, R. A.
Nichols, E. F.
Nichols, E. L.
Pierce, G. W.
Pupin, M. I.
Stratton, S. W.
Thomson, Elihu
Trowbridge, Augustus (chairman, 1923).
Trowbridge, John
Webster, A. G.
Wilson, Edwin B.
Wood, R. W.
Woodward, R. S.

4. ENGINEERING.

Abbot, H. L.
Carty, J. J. (chairman, 1923).
Dunn, Gano
Durand, W. F.
Emmet, W. LeRoy
Freeman, J. R.
Howe, H. M.
Jewett, F. B.
Kennelly, A. E.
Ryan, H. J.
Squier, G. O.
Stillwell, L. B.
Taylor, D. W.

5. CHEMISTRY.

Bancroft, W. D.
Baxter, G. P.
Bogert, M. T.
Boltwood, B. B.
Chandler, C. F.
Clarke, F. W.
Franklin, E. C.
Gomberg, Moses
Gooch, F. A.
Harkins, W. D.
Hillebrand, W. F.
Jackson, C. L.
Johnson, T. B.
Kohler, E. P.
Langmuir, Irving
Lewis, G. N.
Michael, Arthur
Morley, E. W.
Noyes, A. A.
Noyes, W. A. (chairman, 1922).
Osborne, T. B.
Remsen, Ira
Richards, T. W.
Smith, Alexander
Smith, Edgar F.
Stieglitz, Julius
Wells, H. L.
Whitney, W. R.

6. GEOLOGY AND PALEONTOLOGY.

Branner, J. C.
Chamberlin, T. C.
Clarke, J. M.
Cross, Whitman
Dall, W. H.
Dana, E. S.
Davis, W. M.
Day, A. L. (chairman, 1924).
Kemp, J. F.
Leith, C. K.
Lindgren, Waldemar
Merriam, J. C.
Osborn, H. F.
Pumpelly, Raphael
Ransome, F. L.
Reid, H. F.
Schuchert, Charles
Scott, W. B.
Ulrich, E. O.
Vaughan, T. W.
Walcott, C. D.
Washington, H. S.
White, David.
Willis, Bailey

7. BOTANY.

Bailey, L. H. (chairman, 1924)
Britton, N. L.
Campbell, D. H.
Coulter, J. M.
Goodale, G. L.
Harper, R. A.
Jones, L. R.
Osterhout, W. J. V.
Robinson, B. L.
Sargent, C. S.
Setchell, W. A.
Smith, Erwin F.
Thaxter, Roland
Trelease, William

8. ZOOLOGY AND ANIMAL MORPHOLOGY.

Calkins, G. N.
Castle, W. E.
Chapman, F. M.
Conklin, E. G.
Davenport, C. B.
Donaldson, H. H.
Forbes, S. A.
Harrison, R. G.
Herrick, C. J.
Howard, L. O.
Jennings, H. S.
Lillie, F. R.
McClung, C. E.
Mark, E. L.
Mayor, A. G.
Merriam, C. H.
Morgan, T. H. (chairman, 1922).
Morse, E. S.
Parker, G. H.
Pearl, Raymond
Ridgway, Robert
Verrill, A. E.
Wheeler, W. M.
Wilson, Edmund B.

9. PHYSIOLOGY AND PATHOLOGY.

Abel, J. J.
Armsby, H. P.
Benedict, F. G.
Cannon, W. B.
Carlson, A. J.
Chittenden, R. H.
Councilman, W. T.
Cushing, Harvey
Flexner, Simon
Folin, Otto
Halsted, W. S.
Hektoen, Ludvig
Henderson, L. J.
Howell, W. H.
Hunt, Reid
Jones, Walter
Levene, P. A. T.
Loeb, Jacques
Lusk, Graham
MacCallum, W. G.
McCollum, E. V.
Mendel, L. B. (chairman, 1922).
Prudden, T. M.
Smith, Theobald
Van Slyke, D. D.
Vaughan, V. C.
Welch, W. H.

10. ANTHROPOLOGY AND PSYCHOLOGY.

Angell, J. R.
Boas, Franz
Cattell, J. McK
Dewey, John
Fewkes, J. W. (acting chairman).
Hall, G. S.
Holmes, W. H.
Hrdlicka, Ales
Thorndike, E. L.
Woodworth, R. S.

STANDING COMMITTEES.

ON WEIGHTS, MEASURES, AND COINAGE.

Mendenhall, T. C. (chairman).
Michelson, A. A.
Morley, E. W.
Webster, A. G.
Woodward, R. S.

ON SOLAR RESEARCH.

Hale, G. E. (chairman).
Campbell, W. W.
Michelson, A. A.
Nichols, E. L.

ON PUBLICATION.

The President.
The Home Secretary.
Stratton, S. W.

EDITORIAL BOARD OF THE PROCEEDINGS.

The Home Secretary and the Foreign Secretary of the Academy, the Chairman of the Executive Board, and the Permanent Secretary of the National Research Council.

William Duane, 1923.
R. G. Harrison, 1923.
J. C. Merriam, 1923.
E. H. Moore, 1923.
F. Schlesinger, 1923.
W. M. Wheeler, 1923.
F. G. Cottrell
C. E. McClung
Arthur L. Day, 1922.
Gano Dunn, 1922.
L. J. Henderson, 1922.
W. J. V. Osterhout, 1922.
R. M. Yerkes, 1922.
Augustus Trowbridge
E. B. Mathews
Clark Wissler
John M. Clarke, 1921.
Ludvig Hektoen, 1921.
H. S. Jennings, 1921.
R. A. Millikan, 1921.
W. A. Noyes, 1921.
C. A. Adams
G. W. McCoy
F. L. Ransome

ON COLLECTION OF HISTORICAL PORTRAITS, MANUSCRIPTS, INSTRUMENTS, ETC.

Walcott, C. D. (chairman).
Clarke, F. W.
Hale, G. E.
Pupin, M. I.

FINANCE COMMITTEE.

Ransome, F. L. (chairman). Cross, Whitman. Dunn, Gano. Walcott, C. D.

TRUST FUNDS.

THE BACHE FUND.

[$60,000.]

Researches in physical and natural science.

Frost, E. B. (chairman). Harrison, R. G. Webster, A. G.

THE WATSON FUND.

[$25,000.]

Watson medal and the promotion of astronomical research.

Leuschner, A. O. (chairman). Comstock, G. C. Elkin, W. L.

THE HENRY DRAPER FUND.

[$10,000.]

Draper medal and investigations in astronomical physics.

Campbell, W. W. (chairman), 1924. Abbot, C. G., 1926. Hale, G. E., 1923. Michelson, A. A., 1922. Russell, H. N., 1925.

THE J. LAWRENCE SMITH FUND.

[$10,000.]

J. Lawrence Smith medal and investigations of meteoric bodies.

Cross, Whitman (chairman), 1922. Adams, W. S., 1924. Dana, E. S., 1923. Schlesinger, F., 1925. Clarke, F. W., 1926.

THE BARNARD MEDAL.[1]

Meritorious service to science.

Noyes, A. A. (chairman). Campbell, W. W. Nichols, E. F. Morgan, T. H. Richards, T. W.

THE BENJAMIN APTHORP GOULD FUND.

[$20,000.]

Researches in astronomy.

Moulton, F. R. (chairman). Barnard, E. E. Woodward, R. S.

THE WOLCOTT GIBBS FUND.

[$5,545.50.]

Chemical research.

Jackson, C. L. (chairman). Richards, T. W. Smith, Edgar F.

[1] Every five years the committee recommends the person whom they consider most deserving of the medal, and upon the approval of the academy the name of the nominee is forwarded to the trustees of Columbia University, who administer the Barnard medal fund.

THE COMSTOCK FUND.

[$12,406.02.]

Researches in electricity, magnetism, and radiant energy.

Nichols, E. L. (chairman), 1923. Millikan, R. A., 1926. Whitney, W. R., 1924.
Carty, J. J., 1925. Webster, A. G., 1922.

THE MARSH FUND.

[$20,000.]

Original research in the natural sciences.

Merriam, J. C. (chairman), 1922. Clarke, J. M., 1923.
Schuchert, Charles, 1924.

THE AGASSIZ FUND.

[$50,000.]

General uses of the academy.

THE MURRAY FUND.

[$6,000.]

Agassiz medal and contributions to oceanography.

Dall, W. H. (chairman), 1924. Davis, W. M., 1922. Mayor, A. G., 1923.

THE MARCELLUS HARTLEY FUND.

[$1,200.]

Medal for eminence in the application of science to the public welfare.

Noyes, A. A. (chairman), 1922. Stratton, S. W., 1922. Pupin, M. I., 1924.
Osborn, H. F., 1924. Welch, W. H., 1923.
Taylor, D. W., 1923.

THE DANIEL GIRAUD ELLIOT FUND.

[$8,000.]

Medal and honorarium for most meritorious work in zoology or paleontology published in each year.

Osborn, H. F. (chairman). [1] Lucas, F. A. Walcott, C. D.

THE MARY CLARK THOMPSON FUND.

[$10,000.]

Medal for most important services to geology and paleontology.

Clarke, J. M. (chairman), 1922. Lindgren, W., 1923. Osborn, H. F., 1924.

THE JOSEPH HENRY FUND.

[$40,000.]

To assist meritorious investigators, especially in the direction of original research.

Durand, W. F. (chairman). Davenport, C. B. Merriam, J. C.
Day, Arthur L. McClung, C. E.

[1] Not a member of the academy.

MEMBERS OF THE NATIONAL ACADEMY OF SCIENCES.

JUNE. 30, 1921.

	Date of election.
Abbot, Charles Greeley, Smithsonian Institution, Washington, D. C	1915
Abbott, Henry L., U. S. Army, 23 Berkeley Street, Cambridge 38, Mass	1872
Abel, John Jacob, Johns Hopkins University, Baltimore, Md	1912
Adams, Walter Sydney, Solar Observatory Office, Pasadena, Calif	1917
Aitken, Robert Grant, Lick Observatory, Mount Hamilton, Calif	1918
Allen, J. Asaph, American Museum of Natural History, New York City	1876
Ames, Joseph S., Johns Hopkins University, Baltimore, Md	1909
Angell, James Rowland, Carnegie Corporation, New York City	1920
Armsby, Henry Prentiss, State College of Pennsylvania, Pa	1920
Bailey, Liberty Hyde, Ithaca, N. Y	1917
Bancroft, W. D., 7 East Avenue, Ithaca, N. Y	1920
Barnard, E. E., Yerkes Observatory, Williams Bay, Wis	1911
Barus, Carl, Brown University, Providence, R. I	1892
Baxter, Gregory Paul, T. J. Coolidge, jr., Memorial Laboratory, Cambridge, Mass	1916
Bell, A. Graham, 1331 Connecticut Avenue, Washington, D. C	1883
Benedict, Francis Gano, Nutrition Laboratory, Boston 17, Mass	1914
Birkhoff, George David, Harvard University, Cambridge, Mass	1918
Blichfeldt, Hans Frederick, Leland Stanford University, Calif	1920
Bliss, Gilbert Ames, University of Chicago, Chicago, Ill	1916
Boas, Franz, Columbia University, New York City	1900
Bogert, Marston Taylor, Columbia University, New York City	1916
Boltwood, B. B., Yale University, New Haven, Conn	1911
Bolza, Oskar, Reichsgrafenstr. 10, Freiburg, Germany	1909
Branner, John C., Stanford University, California	1905
Bridgeman, Percy Williams, Jefferson Physical Laboratory, Cambridge, Mass	1918
Britton, Nathaniel Lord, New York Botanical Gardens, New York City	1914
Calkins, Gary Nathan, Columbia University, New York City	1919
Campbell, D. H., Leland Stanford University, Calif	1910
Campbell, William W., Lick Observatory, Mount Hamilton, Calif	1902
Cannon, Walter Bradford, Harvard University, Cambridge, Mass	1914
Carlson, Anton Julius, University of Chicago, Chicago, Ill	1920
Carty, John J., American Telegraph & Telephone Co., New York City	1917
Castle, William Ernest, 186 Payson Road, Belmont, Mass	1915
Cattell, James McK., Garrison, N. Y	1901
Chamberlin, Thomas C., University of Chicago, Chicago, Ill	1903
Chandler, Charles F., Columbia University, New York City	1874
Chapman, Frank Michler, American Museum of Natural History, New York City	1921
Chittenden, Russell H., Sheffield Scientific School, New Haven, Conn	1890
Clarke, F. W., U. S. Geological Survey, Washington, D. C	1909
Clarke, J. M., State Museum, Albany, N. Y	1909
Comstock, George C., Washburn Observatory, Madison, Wis	1899

	Date of election.
Conklin, E. G., Princeton, N. J	1908
Coulter, J. M., University of Chicago, Chicago, Ill	1909
Councilman, William T., Harvard Medical School, Boston, Mass	1904
Crew, Henry, Northwestern University, Evanston, Ill	1909
Cross, Whitman, 2138 Bancroft Place, Washington, D. C	1908
Curtis, Heber Doust, Allegheny Observatory, Pittsburgh, Pa	1919
Cushing, Harvey, Harvard University, Cambridge, Mass	1917
Dall, William H., Smithsonian Institution, Washington, D. C	1897
Dana, Edward S., Yale University, New Haven, Conn	1884
Davenport, Charles B., Cold Spring Harbor, N. Y	1912
Davis, William Morris, 31 Hawthorn Street, Cambridge 38, Mass	1904
Day, Arthur L., 2801 Upton Street, Washington, D. C	1911
Dewey, John, Columbia University, New York City	1910
Dickson, Leonard E., University of Chicago, Chicago, Ill	1913
Donaldson, Henry Herbert, Wistar Institute of Anatomy, Philadelphia, Pa	1914
Duane, William, Harvard University Medical School, Cambridge, Mass	1920
Dunn, Gano, 43 Exchange Place, New York City	1919
Durand, William Frederick, Leland Stanford University, Calif	1917
Elkin, William L., Yale University Observatory, New Haven, Conn	1917
Emmet, William Le Roy, General Electric Co., Schenectady, N. Y	1921
Fewkes, Jesse Walter, Bureau of American Ethnology, Washington, D. C	1914
Flexner, Simon, Rockefeller Institute, New York City	1908
Folin, Otto, Harvard Medical School, Boston, Mass	1916
Forbes, Stephen Alfred, Urbana, Ill	1918
Franklin, Edward Curtis, Leland Stanford University, Calif	1914
Freeman, John Ripley, Providence, R. I	1918
Frost, Edwin B., Yerkes Observatory, Williams Bay, Wis	1908
Gomberg, Moses, University of Michigan, Ann Arbor, Mich	1914
Gooch, Frank A., 291 Edwards Street, New Haven, Conn	1897
Goodale, George L., Harvard University, Cambridge, Mass	1890
Hale, George E., Solar Observatory Office, Pasadena, Calif	1902
Hall, Edwin H., Harvard University, Cambridge, Mass	1911
Hall, Granville Stanley, Clark University, Worcester, Mass	1915
Halsted, William Stewart, Johns Hopkins Medical School, Baltimore, Md	1917
Harkins, William Draper, University of Chicago, Chicago, Ill	1921
Harper, R. A., Columbia University, New York City	1911
Harrison, Ross G., Yale University, New Haven, Conn	1913
Hastings, Charles S., Yale University, New Haven, Conn	1889
Hayford, John F., Northwestern University, Evanston, Ill	1911
Hektoen, Ludvig, 637 South Wood Street, Chicago, Ill	1918
Henderson, Lawrence Joseph, Harvard University, Cambridge, Mass	1919
Herrick, Charles Judson, University of Chicago, Chicago, Ill	1918
Hillebrand, William F., Bureau of Standards, Washington, D. C	1908
Holmes, William H., U. S. National Museum, Washington, D. C	1905
Howard, Leland Ossian, U. S. Dept. of Agriculture, Washington, D. C	1916
Howe, Henry Marion, Broad Brook Road, Bedford Hills, N. Y	1917
Howell, William H., School of Hygiene and Public Health, Baltimore, Md	1905
Hrdlicka, Ales, United States National Museum, Washington, D. C	1921
Hunt, Reid, Harvard Medical School, Boston, Mass	1919
Jackson, Charles L., 383 Beacon Street, Boston, Mass	1883

	Date of election.
Jennings, Herbert Spencer, Johns Hopkins University, Baltimore, Md	1914
Jewett, Frank Baldwin, Western Electric Co., New York, N. Y	1918
Johnson, Treat Baldwin, Yale University, New Haven, Conn	1919
Jones, Lewis Ralph, University of Wisconsin, Madison, Wis	1920
Jones, Walter, Johns Hopkins University, Baltimore, Md	1918
Kasner, Edward, Columbia University, New York City	1917
Kemp, James F., Columbia University, New York City	1911
Kennelly, Arthur Edwin, Harvard University, Cambridge, Mass	1921
Kohler, Elmer Peter, Harvard University, Cambridge, Mass	1920
Langmuir, Irving, General Electric Co., Schenectady, N. Y	1918
Leith, Charles Kenneth, University of Wisconsin, Madison, Wis	1920
Leuschner, Armin O., University of California, Berkeley, Calif	1913
Levene, Phœbus Aaron Theodor, Rockefeller Institute, New York City	1916
Lewis, Gilbert N., University of California, Berkeley, Calif	1913
Lillie, Frank Rattray, University of Chicago, Chicago, Ill	1915
Lindgren, Waldemar, Mass. Institute of Technology, Cambridge, Mass	1909
Loeb, Jacques, Rockefeller Institute, New York City	1910
Lusk, Graham, Cornell University Medical College, New York City	1915
Lyman, Theodore, Harvard University, Cambridge, Mass	1917
MacCallum, William George, Johns Hopkins Hospital, Baltimore, Md	1921
McClung, Clarence E., University of Pennsylvania, Philadelphia, Pa	1920
McCollum, Elmer Vernon, Johns Hopkins Med. School, Baltimore, Md	1920
Mark, Edward L., 109 Irving Street, Cambridge, Mass	1903
Mayor, Alfred Goldsborough, 276 Nassau Street, Princeton, N. J	1913
Mendel, Lafayette B., Yale University, New Haven, Conn	1913
Mendenhall, Charles Elwood, University of Wisconsin, Madison, Wis	1918
Mendenhall, Thomas C., 329 North Chestnut Street, Ravenna, Ohio	1887
Merriam, C. Hart, 1919 Sixteenth Street, Washington, D. C	1902
Merriam, John Campbell, Carnegie Institution, Washington, D. C	1918
Merritt, Ernest, Cornell University, Itaca, N. Y	1914
Michael, Arthur, 219 Parker Street, Newton Center, Mass	1889
Michelson, Albert A., University of Chicago, Chicago, Ill	1888
Miller, Dayton C., Case School of Applied Science, Cleveland, Ohio	1921
Miller, George Abram, University of Illinois, Urbana, Ill	1921
Millikan, Robert Andrews, California Inst. of Technology, Pasadena, Calif	1915
Moore, Eliakim H., University of Chicago, Chicago, Ill	1901
Morgan, T. H., Columbia University, New York City	1909
Morley, Edward W., West Hartford, Conn	1897
Morse, Edward S., Salem, Mass	1876
Moulton, F. R., University of Chicago, Chicago, Ill	1910
Nichols, Edward L., Cornell University, Ithaca, N. Y	1901
Nichols, Ernest F., Mass. Institute of Technology, Cambridge, Mass	1908
Noyes, Arthur A., California Institute of Technology, Pasadena, Calif	1905
Noyes, William A., University of Illinois, Urbana, Ill	1910
Osborn, H. F., American Museum of Natural History, New York City	1900
Osborne, T. B., Agricultural Experiment Station, New Haven, Conn	1910
Osgood, William Fogg, Harvard University, Cambridge, Mass	1904
Osterhout, Winthrop John Vanleuven, Harvard University, Cambridge, Mass	1919

	Date of election.
Parker, George H., 16 Berkeley Street, Cambridge, Mass	1913
Pearl, Raymond, 625 St. Paul Street, Baltimore, Md	1916
Pierce, George Washington, Harvard University, Cambridge, Mass	1920
Prudden, T. Mitchell, 160 West 59th Street, New York City	1901
Pumpelly, Raphael, Gibbs Avenue, Newport, R. I	1872
Pupin, Michael I., Columbia University, New York City	1905
Ransome, Frederick Leslie, United States Geological Survey, Washington, D. C.	1914
Reid, H. Fielding, Johns Hopkins University, Baltimore, Md.	1912
Remsen, Ira, Johns Hopkins University, Baltimore, Md.	1882
Richards, Theodore W., Wolcott Gibbs Memorial Laboratory, Cambridge, Mass.	1899
Ridgway, Robert, 1030 South Morgan Street, Olney, Ill.	1917
Robinson, Benjamin Lincoln, Harvard University, Cambridge, Mass.	1921
Russell, Henry Norris, Princeton University, Princeton, N. J.	1918
Ryan, Harris Joseph, Stanford University, Stanford, Calif.	1920
Sargent, Charles S., Arnold Arboretum, Jamaica Plains, Mass.	1895
Schlesinger, Frank, Yale University Observatory, New Haven, Conn	1916
Schuchert, Charles, Yale University, New Haven, Conn	1910
Scott, William B., Princeton University, Princeton, N. J.	1906
Seares, Frederick Hanley, Mount Wilson Observatory, Pasadena, Calif.	1919
Setchell, William Albert, University of California, Berkeley, Calif.	1919
Slipher, Vesto Melvin, Lowell Observatory, Flagstaff, Ariz	1921
Smith, Alexander, Columbia University, New York City	1915
Smith, Edgar F., University of Pennsylvania, Philadelphia, Pa	1899
Smith, Erwin F., Bureau of Plant Industry, Washington, D. C.	1913
Smith, Theobald, Rockefeller Institute for Medical Research, Princeton, N. J.	1908
Squier, George Owen, Chief Signal Officer, United States Army, Washington, D. C.	1919
Stebbins, Joel, University of Illinois Observatory, Urbana, Ill.	1920
Stieglitz, Julius, University of Chicago, Chicago, Ill.	1911
Stillwell, Lewis Buckley, 143 Liberty Street, New York City	1921
Story, William E., Clark University, Worcester, Mass.	1908
Stratton, Samuel Wesley, Bureau of Standards, Washington, D. C.	1917
Taylor, David Watson, Department of the Navy, Washington, D. C.	1918
Thaxter, Roland, Harvard University, Cambridge, Mass.	1912
Thomson, Elihu, Swampscott, Mass.	1907
Thorndike, Edward Lee, Columbia University, New York City	1917
Trelease, William, University of Illinois, Urbana, Ill.	1902
Trowbridge, Augustus, Princeton University, Princeton, N. J.	1919
Trowbridge, John, Harvard University, Cambridge, Mass.	1878
Ulrich, Edward Oscar, U. S. Geological Survey, Washington, D. C.	1917
Van Slyke, Donald Dexter, Rockefeller Institute, New York City	1921
Van Vleck, E. B., University of Wisconsin, Madison, Wis.	1911
Vaughan, T. Wayland, U. S. National Museum, Washington, D. C	1921
Vaughan, Victor Clarence, University of Michigan, Ann Arbor, Mich.	1915
Veblen, Oswald, Princeton University, Princeton, N. J.	1919
Verrill, A. E., 582 Central Avenue, Westville, Conn.	1872

	Date of election.
Walcott, Charles D., Smithsonian Institution, Washington, D. C.	1896
Washington, Henry Stephens, Geophysical Laboratory, Washington, D. C.	1921
Webster, Arthur G., Clark University, Worcester, Mass.	1903
Welch, William H., 807 St. Paul Street, Baltimore, Md.	1895
Wells, Horace L., Yale University, New Haven, Conn.	1903
Wheeler, William M., Harvard University, Cambridge, Mass.	1912
White, David, United States Geological Survey, Washington, D. C.	1912
White, Henry Seely, Vassar College, Poughkeepsie, N. Y.	1915
Whitney, Willis Rodney, General Electric Co., Schenectady, N. Y.	1917
Wilczynski, Ernest Julius, University of Chicago, Chicago, Ill.	1919
Willis, Bailey, Leland Stanford University, Stanford, Calif.	1920
Wilson, Edmund B., Columbia University, New York City	1899
Wilson, Edwin B., Massachusetts Institute of Technology, Cambridge, Mass.	1919
Wood, Robert W., Johns Hopkins University, Baltimore, Md.	1912
Woodward, Robert S., Carnegie Institution, Washington, D. C.	1896
Woodworth, Robert Sessions, Columbia University, New York City	1921

HONORARY MEMBER.

Smith, Sidney I., Yale University, New Haven, Conn.	1884

FOREIGN ASSOCIATES.

Adams, Frank Dawson, McGill University, Montreal, Canada	1920
Arrhenius, S. A., Nobelinstitut, Stockholm	1908
Barrois, Charles, Université, Lille	1908
Bateson, William, John Innes Horticultural Institution, Merton Park, Surrey	1921
Brøgger, W. C., Universitet, Christiania	1903
De Vries, Hugo, Lunteren, Holland	1904
Deslandres, Henri, Astrophysical Observatory, Meudon	1913
Dewar, Sir James, University, Cambridge, England	1907
Eijkman, Christian, University of Utrecht, Utrecht, Holland	1921
Forsyth, A. R., Imperial College of Science and Technology, London	1907
Geikie, Sir Archibald, Haslemere, Surrey	1901
Groth, Paul von, Universität, Munich	1905
Heim, Albert, Zürich	1913
Hilbert, David, Universität, Göttingen	1907
Jordan, Marie Ennemond Camille, College of France, Paris	1920
Kapteyn, John C., Rijks Universiteit, Groningen	1907
Klein, Felix, Universität, Göttingen	1898
Kossel, Albrecht, Heidelberg	1913
Küstner, Karl Friedrich, Bonn	1913
Lacroix, François Antoine Alfred, Musée d'Histoire Naturelle, Paris	1920
Lankester, Sir E. Ray, South Kensington, London	1903
Larmor, Sir Joseph, St. Johns College, Cambridge	1908
Lorentz, Hendrik Anton, Rijks Universiteit, Leiden	1906
Onnes, Heike Kammerlingh, University of Leiden, Leiden	1920
Ostwald, Wilheim, Grossbothen bei Leipzig	1906
Pavlov, Ivan Petrovitch, Inst. for Experimental Medicine, Petrograd	1908
Penck, Albrecht, Universität, Berlin	1909
Picard, Charles Émile, Université, Paris	1903

	Date of election.
Prain, Sir David, Royal Botanic Gardens, Kew, Surrey	1920
Ramon y Cajal, Santiago, University of Madrid, Madrid	1920
Rutherford, Sir Ernest, Newnham Cottage, Queen's Road, Cambridge	1911
Schuster, Sir Arthur, Yeldall, Twyford, Berkshire	1913
Seeliger, Hugo Ritter von, Universität, Munich	1908
Thomson, Sir Joseph, University, Cambridge	1930
Volterra, Vito, Università, Rome	1911
Van der Waals, Johannes D., Amsterdam	1913
Wolf, Max F. J. C., Heidelberg	1913

Deceased members.

	Date of election.	Date of death.		Date of election.	Date of death.
Abbe, Cleveland	1878	Oct. 28, 1916	Davidson, George	1874 [2]	Dec. 2, 1911
Agassiz, Alexander	1866	Mar. 27, 1910	Davis, Charles H	(1)	Feb. 18, 1877
Agassiz, Louis	(1)	Dec. 14, 1873	Draper, Henry	1877	Nov. 20, 1882
Atkinson, George Francis	1918 [2]	Nov. 14, 1918	Draper, John W	1877	Jan. 4, 1882
Alexander, J. H	(1)	Mar. 2, 1867	Dutton, C. E	1884 [2]	Jan. 4, 1912
Alexander, Stephen	(1)	June 25, 1883	Eads, James B	1872	Mar. 8, 1887
Bache, Alexander Dallas	(1)	Feb. 14, 1867	Emmons, Samuel F	1892	Mar. 28, 1911
Baird, Spencer F	1864	Aug. 19, 1887	Engelmann, George	(1)	Feb. 4, 1884
Barker, George F	1876 [2]	May 24, 1910	Farlow, W. G	1879 [2]	June 3, 1919
Barnard, F. A. P	(1, 2)	Apr. 27, 1889	Ferrel, William	1868	Sept. 18, 1891
Barnard, J. G	(1)	May 14, 1882	Fraser, John Fries	(1)	Oct. 12, 1872
Barrell, Joseph	1919 [2]	May 4, 1919	Gabb, William M	1876	May 30, 1878
Bartlett, W. H. C	(1)	Feb. 11, 1893	Genth, F. A	1872	Feb. 2, 1893
Becker, George Ferdinand	1901 [2]	Apr. 20, 1919	Gibbs, Josiah Willard	1879	Apr. 28, 1903
Beecher, Charles Emerson	1899	Feb. 14, 1904	Gibbs, Wolcott	(1)	Dec. 9, 1908
Billings, John S	1883	Mar. 11, 1913	Gilbert, Grove Karl	1883 [2]	May 1, 1918
Bôcher, Maxime	1909 [2]	Sept. 12, 1918	Gill, Theodore Nicholas	1873	Sept. 25, 1914
Boss, Lewis	1889	Oct. 5, 1912	Gilliss, James Melville	(1)	Feb. 9, 1865
Bowditch, Henry P	1887 [2]	Mar. 13, 1911	Goode, G. Brown	1888	Sept. 6, 1896
Brewer, William H	1880 [2]	Nov. 2, 1910	Gould, Augustus A	(1)	Sept. 15, 1866
Brooks, William Keith	1884	Nov. 12, 1908	Gould, Benjamin A	(1, 2)	Nov. 26, 1896
Brown-Sequard, Chas. E	1868	Apr. 2, 1894	Gray, Asa	(1)	Jan. 30, 1888
Brush, George Jarvis	1868 [2]	Feb. 6, 1912	Guyot, Arnold	(1)	Feb. 8, 1884
Bumstead, Henry A	1913 [2]	Dec. 31, 1920	Hadley, James	1872	Nov. 14, 1872
Casey, Thomas L	1890	Mar. 25, 1896	Hague, Arnold	1885	May 15, 1917
Caswell, Alexis	(1)	Jan. 8, 1877	Haldeman, S. S	1876	Sept. 20, 1880
Chandler, Seth Carlo	1888 [2]	Dec. 31, 1913	Hall, Asaph	1875	Nov. 22, 1907
Chauvenet, William	(1)	Dec. 13, 1879	Hall, James	(1, 2)	Aug. 7, 1898
Clark, Henry James	1872	July 1, 1873	Hayden, F. V	1873	Dec. 22, 1887
Clark, William B	1908	July 27, 1917	Henry, Joseph	(1)	May 13, 1878
Coffin, James H	1869	Feb. 6, 1873	Hilgard, Eugene W	1872	Jan. 8, 1916
Coffin, J. H. C	(1)	Jan. 8, 1890	Hilgard, Julius E	(1)	May 9, 1890
Comstock, Cyrus B	1884	May 29, 1910	Hill, George William	1874	Apr. 16, 1914
Cook, George H	1887	Sept. 22, 1889	Hill, Henry B	1883	Apr. 6, 1903
Cooke, Josiah P	1872	Sept. 3, 1894	Hitchcock, Edward	(1)	Feb. 27, 1864
Cope, Edward D	1872 [2]	Apr. 12, 1897	Holbrook, J. E	1868	Sept. 8, 1871
Coues, Elliott	1877	Dec. 25, 1899	Holden, Edward Singleton	1885	Mar. 16, 1914
Crafts, James M	1872	June 21, 1917	Hubbard, J. S	(1)	Aug. 16, 1863
Dalton, J. C	1864	Feb. 2, 1889	Humphreys, A. A	(1)	Dec. 27, 1883
Dana, James D	(1)	Apr. 14, 1895	Hunt, T. Stery	1873 [2]	Feb. 12, 1892

[1] Charter members, Mar. 3, 1863.

[2] Biographical memoirs have not been presented.

Deceased members—Continued.

	Date of election.	Date of death.
Hyatt, Alpheus	1875	Jan. 15, 1902
Iddings, Joseph P	1807 [2]	Sept. 8, 1920
James, William [3]	1903	Aug. 26, 1910
Johnson, S. W	1866	July 21, 1909
Keeler, J. E	1900	Aug. 12, 1900
King, Clarence	1876	Dec. 24, 1901
Kirtland, Jared P	1865	Dec. 10, 1877
Lane, J. Homer	1872	May 3, 1880
Langley, Samuel P	1876	Feb. 27, 1906
Lea, Matthew Carey	1892	Mar. 15, 1897
Le Conte, John	1878	Apr. 29, 1891
Le Conte, John L	(1)	Nov. 15, 1883
Le Conte, Joseph	1875	July 6, 1901
Leidy, Joseph	(1)	Apr. 30, 1891
Lesley, J. Peter	(1)	June 1, 1903
Lesquereux, Leo	1864	Oct. 20, 1889
Longstreth, Miers F	(1)	Dec. 27, 1891
Loomis, Elias	1873	Aug. 15, 1889
Lovering, Joseph	1873	Jan. 18, 1892
Lyman, Theodore	1872	Sept. 9, 1897
Mahan, D. H	(1)	Sept. 16, 1871
Mall, Franklin P	1907 [2]	Nov. 17, 1917
Marsh, G. P	1866	July 23, 1882
Marsh, O. C	1874 [2]	Mar. 18, 1899
Mayer, Alfred M	1872	July 13, 1897
Meek, F. B	1869	Dec. 21, 1876
Meigs, M. C	1865	Jan. 2, 1892
Meltzer, Samuel James	1912 [2]	Nov. 8, 1920
Minot, Charles Sedgwick	1897	Nov. 19, 1914
Mitchell, Henry	1885 [2]	Dec. 1, 1902
Mitchell, Silas Weir	1865	Jan. 4, 1914
Morgan, Lewis H	1875	Dec. 17, 1881
Morse, Harmon N	1907 [2]	Sept. 8, 1920
Morton, Henry	1874	May 9, 1902
Nef, John Ulric	1904 [2]	Aug. 13, 1915
Newberry, J. S	(1)	Dec. 7, 1892
Newcomb, Simon	1869 [2]	July 11, 1909
Newton, H. A	(1)	Aug. 12, 1896
Newton, John	1876	May 1, 1895
Norton, William A	1873	Sept. 21, 1883
Oliver, James E	1872	Mar. 27, 1895
Packard, A. S	1872	Feb. 14, 1905
Penfield, Samuel L	1900	Aug. 13, 1906
Peters, C. H. F	1876 [2]	July 18, 1890
Peirce, Benjamin [3]	(1, 2)	Oct. 6, 1880
Peirce, Benjamin Osgood	1906	Jan. 14, 1914
Pickering, Edward C	1873 [2]	Feb. 3, 1919
Pierce, Charles S. S	1876 [2]	Apr. 20, 1914
Pirsson, Louis V	1913 [2]	Dec. 8, 1919
Pourtales, L. F	1873	July 19, 1880
Powell, John W	1880	Sept. 23, 1902
Putnam, Frederick W	1885 [2]	Aug. 18, 1915
Rodgers, John	(1)	May 5, 1882
Rogers, Fairman	(1)	Aug. 22, 1900
Rogers, Robert E. [4]	(1)	Sept. 6, 1884
Rogers, William A	1885	Mar. 1, 1898
Rogers, William B. [5]	(1)	May 30, 1882
Rood, Ogden N	1865	Nov. 12, 1902
Rosa, E. B	1913 [2]	May 17, 1921
Rowland, Henry A	1881	Apr. 16, 1901
Royce, Josiah	1906 [2]	Sept. 14, 1916
Rutherfurd, Lewis M	(1)	May 30, 1892
Sabine, Wallace C. W	1917 [2]	Jan. 10, 1919
Saxton, Joseph	(1)	Oct. 26, 1873
Schott, Charles A	1872	July 31, 1901
Scudder, Samuel H	1877 [2]	May 17, 1911
Sellers, William	1873 [2]	Jan. 24, 1905
Silliman, Benj., sr	(1)	Nov. 24, 1864
Silliman, Benj., jr	(1)	Jan. 14, 1885
Smith, J. Lawrence	1872	Oct. 12, 1883
Smith, Richmond Mayo	1890 [2]	Nov. 11, 1901
Stimpson, William	1868	May 26, 1872
Strong, Theodore	(1)	Feb. 1, 1869
Sullivant, W. S	1872	Apr. 30, 1873
Torrey, John	(1)	Mar. 10, 1873
Totten, J. G	(1)	Apr. 22, 1864
Trowbridge, William P	1872	Aug. 12, 1892
Trumbull, James H	1872	Aug. 5, 1897
Tuckerman, Edward	1868	Mar. 15, 1886
Van Hise, C. R	1902 [2]	Nov. 19, 1918
Walker, Francis A	1878	Jan. 5, 1897
Warren, G. K	1876	Aug. 8, 1882
Watson, James C	1868	Nov. 23, 1880
Watson, Sereno	1889	Mar. 9, 1892
Wheeler, Henry Lord	1909 [2]	Oct. 30, 1914
White, Charles A	1889	June 29, 1910
Whitman, C. O	1895	Dec. 6, 1910
Whitney, Josiah D. [3]	(1, 2)	Aug. 19, 1896
Whitney, William D. [3]	1865 [2]	June 29, 1894
Williston, Samuel W	1915 [2]	Aug. 30, 1918
Winlock, Joseph	(1)	June 11, 1875
Wood, Horatio C	1879 [2]	Jan. 3, 1920
Woodward, J. J	1873	Aug. 17, 1884
Worthen, A. H	1872	May 6, 1888
Wright, Arthur Williams	1881 [2]	Dec. 19, 1915
Wyman, Jeffries	(1)	Sept. 4, 1874
Young, Charles A	1872	Jan. 3, 1908

[1] Charter members, Mar. 3, 1863
[2] Biographical memoirs have not been presented.
[3] Resigned 1873.
[4] Dropped —, reelected 1875.
[5] Dropped —, reelected 1872.

DECEASED FOREIGN ASSOCIATES.

Adams, J. C.
Airy, Sir George B.
Argelander, F. W. A.
Auwers, G. F. J. Arthur
Backlund, Oskar
Baer, Karl Ernest von
Baeyer, Adolf von
Barrande, Joachin
Beaumont, L. Élie de
Becquerel, Henri
Berthelot, M. P. E.
Bertrand, J. L. F.
Boltzmann, Ludwig
Bornet, Edouard
Boussingault, J. B. J. D.
Boveri, Theodor
Braun, Alexander
Brewster, Sir David
Bunsen, Robert W.
Burmeister, C. H. C.
Candolle, Alphonse de
Cayley, Arthur
Chasles, Michel
Chevreul, M. E.
Clausius, Rudolph
Cornu, Alfred
Crookes, Sir William
Darboux, Gaston
Darwin, Sir George Howard
Dove, H. W.
Dumas, J. B.
Ehrlich, Paul
Faraday, Michael
Fischer, Emil
Gegenbaur, Karl
Glydén, Hugo
Gill, Sir David
Hamilton, Sir William Rowan
Helmholtz, Baron H. von
Hoff, J. H. van't
Hofmann, A. W.
Hooker, Sir Joseph D.
Huggins, Sir William
Huxley, T. H.
Ibañez, Carlos
Janssen, J.
Joule, James P.
Kekulé, August
Kelvin, Lord
Kirchoff, G. R.
Koch, Robert
Kölliker, Albert von
Kohlrausch, Friedrich
Kronecker, Hugo
Lacaze-Duthiers, Henri de
Leuckart, Rudolph
Lie, Sophus
Liebig, Justus von
Lister, Lord
Loewy, Maurice
Ludwig, K. F. W.
Marey, E. J.
Mendeléeff, D. I.
Milne-Edwards, Henri
Moissan, Henri
Murchison, Sir Roderick I.
Murray, Sir John
Oppolzer, Theodore von
Owen, Sir Richard
Pasteur, Louis
Peters, C. A. F.
Pfeffer, Wilhelm
Plana, G. A. A.
Poincaré, Jules Henri
Rammelsberg, C. F.
Ramsay, Sir William
Rayleigh, Lord
Regnault, Victor
Retzius, Gustav
Reymond, Emil Du Bois
Richthofen, F. von
Rosenbusch, Karl Harry Ferdinand
Sachs, Julius von
Schiaparelli, Giovanni
Stas, Jean Servais
Stokes, Sir George G.
Strasburger, Edouard
Struve, Otto von
Suess, Eduard
Sylvester, J. J.
Tisserand, F. F.
Virchow, Rudolph von
Vogel, H. C.
Waldeyer, Wilhelm
Weierstrass, Karl
Weismann, August
Wöhler, Friedrich
Wundt, Wilhelm
Würtz, Adolph
Zirkel, Ferdinand
Zittell, K. A. R. von

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